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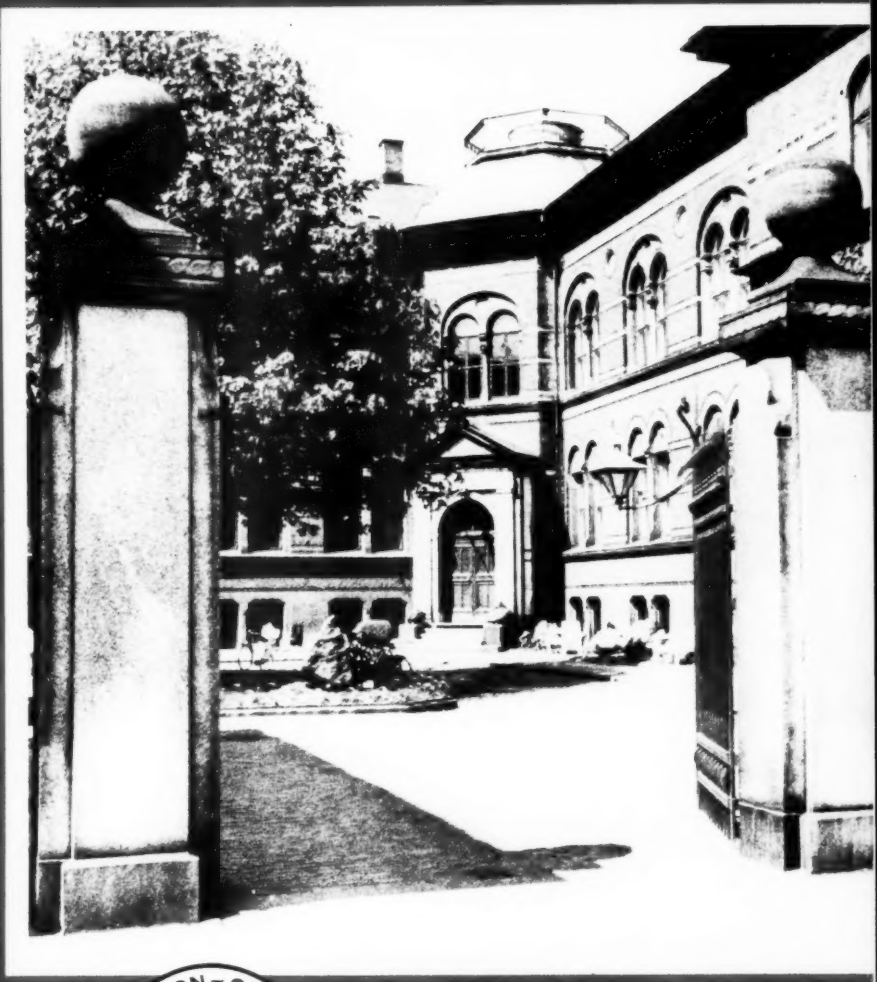

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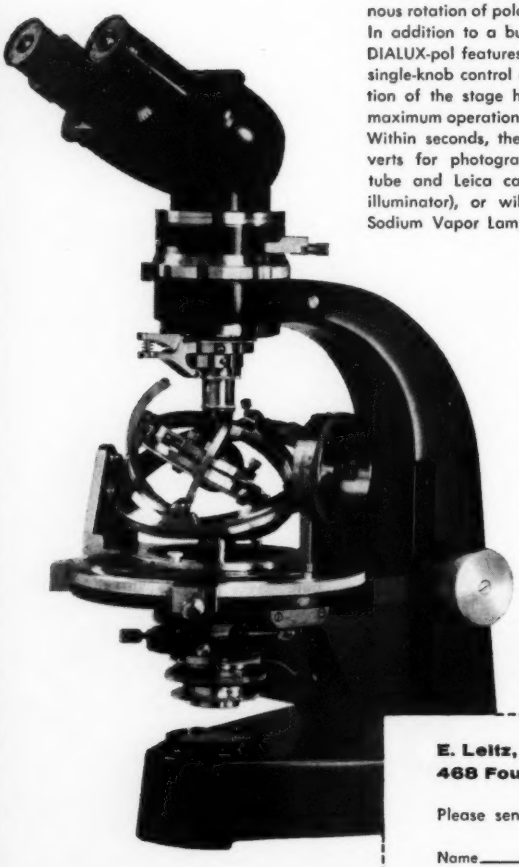

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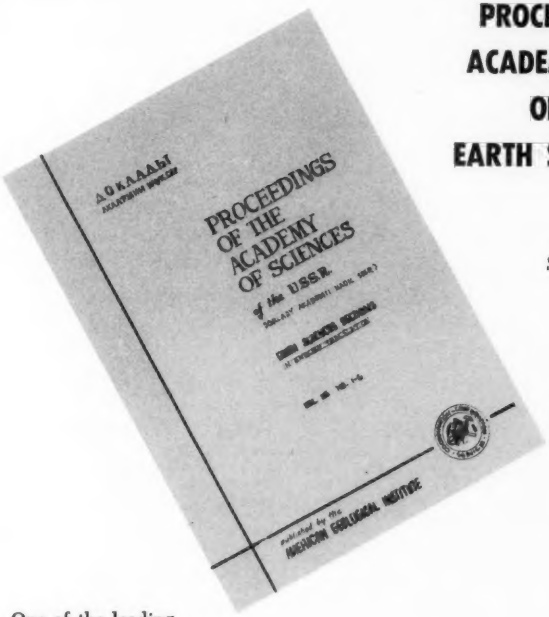

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FIRST ISSUE SCHEDULED FOR NOVEMBER 1959

Calendar

Cooperation of Society Secretaries in supplying meeting notices for GEOTIMES calendar is requested.

Oct. 8-10, 1959—AAPG: SW Fed. of Geol. Soc's., 2nd Ann. mtg., Lubbock, Texas.

Oct. 8-10, 1959—NINTH ANN. EXPLORATION DRILLING SYMPOSIUM, University Park, Pa. Co-sponsored by departments of Mining at Pennsylvania State University, Colo. School of Mines and Univ. of Minnesota.

October 8-10, 1959—OPTICAL SOC. OF AMERICA, Ann. Mtg., Chateau Laurier, Ottawa, Canada.

Oct. 12-14, 1959—EIGHTH NATIONAL CLAY CONFERENCE, Univ. of Oklahoma campus, Norman.

Oct. 22-23, 1959—AIME: Los Angeles Basin Sect., Fall Mtg., Huntington Sheraton Hotel, Pasadena, Calif.

Oct. 27-29, 1959—AIME: Joint Solid Fuels Conf., Netherlands Plaza Hotel, Cincinnati, Ohio.

*Oct. 27-31, 1959—AAPG: Mid-Continent-Kans. Geol. Soc. Mtg., Broadview Hotel, Wichita. Two one-day field trips of Pennsylvanian and Permian rocks of south-central Kansas; write: Merriam, Univ. of Kans., Lawrence.

Oct. 29-30, 1959—AIME: Oil Recovery Symposium on SW Texas, Corpus Christi, Tex.

Oct. 29-31, 1959—INDIANA ACAD. OF SCIENCE, Annual Meeting, Butler University, Indianapolis.

Nov. 1959—INTERNAT. ATOMIC ENERGY AGENCY, Conference on Disposal of Atomic Waste, Monaco. Write: Agency, c/o Kaerntnerring, Vienna I, Austria.

*Nov. 2-4, 1959—GSA: Ann. Mtg., with Pittsburgh Geol. Soc., Penn-Sheraton Hotel, Pittsburgh, Pa. in conjunction with PS, MSA, GS & SEcG. Field trips before and after the meetings, also local excursions. Write: Buckwalter, U. of Pgh., Pittsburgh, Pa.

Nov. 9-12, 1959—SEGp: Ann. Mtg., Biltmore Hotel, Los Angeles, Calif. Jointly with Pacific Section of AAPG on Nov. 12.

Nov. 11-13, 1959—GCAGS: Houston, Texas.

Nov. 12-13, 1959—AAPG: PACIFIC SECT., Biltmore Hotel, Los Angeles, Calif. Jointly with SEGp on Nov. 12.

Dec. 4-5, 1959—NAGT: ANNUAL MEETING, Ohio State University, Columbus, Ohio.

Dec. 12-13, 1959—OKLAHOMA ACAD. OF SCIENCE, Earth Science Sect., Ann. Mtg., Weatherford, Okla.

Dec. 26-31, 1959—AAS; Ann. Mtg, Chicago.

Jan. 11-13, 1960—FIRST INTERNAT. SYMPOSIUM on Arctic Geology, sponsored by Alberta Soc. of Petrol. Geologists; Calgary, Alta., Canada.

Feb. 14-18, 1960—AIME: Ann. Mtg., Hotel Statler & Hotel McAlpin, New York, with SEcG.

Mar. 20-26, 1960—ACSM-ASP: Annual Meeting, Shoreham Hotel, Washington, D. C.

*Mar. 24-26, 1960—GSA: Southeastern Section meeting, sponsored jointly by Univ. of Kentucky Geol. Dept., Kentucky Geol. Survey, and Kentucky Geol. Soc., Lexington, Ky. Field trips (2) on third day. Write: Thomas G. Roberts, Dept. of Geol., Univ. of Ky., Lexington, Ky.

April 3-8, 1960—ENGINEERS JOINT COUNCIL, 6th Nuclear Congress, New York. Write: Council, 29 W. 39th St., New York 18.

April 24-28, 1960—ACerS: 62nd Annual Meeting, Bellevue-Stratford Hotel, Philadelphia.

April 25-27, 1960—CIM Ann. Mtg., Royal York Hotel, Toronto, Canada.

April 25-28, 1960—AAPG-SEPM: Ann. Mtg., Chalfonte-Hadden Hall, Atlantic City.

May 2-3, 1960—AIME: SOC. PET. ENGNRS., Wichita Falls, Texas.

May 26-27, 1960—AIME: Rocky Mountain Pet. Sec's, Calgary, Canada.

May 26-28, 1960—ALBERTA SOC. OF PETROLEUM GEOLOGISTS, regional meeting, Banff, Alta.

July 25-Aug. 6, 1960—IUGG: General Assembly, Helsinki, Finland. Inquire: Sec. Gen. G. Laclavere, 30 Avenue Rapp, Paris 7, France.

*Aug. 6-12, 1960—19th INTERNATIONAL GEOGRAPHIC CONGRESS, General Assembly of the IGU and meetings of the IGU Commission, Stockholm, Sweden. Inquire: The International Geographic Congress Postfack Stockholm 6, Sweden.

Aug. 14-24, 1960—7th INTERNAT. CONGRESS OF SOIL SCIENCE, Madison, Wisc.

*Aug. 15 - 25, 1960 — XXI INTERNATIONAL GEOLOGICAL CONGRESS, to be held at the Mineralogical Geological Museum of the University of Copenhagen in Denmark. Field trips before and after the meetings.

1959 SCHEDULE OF FIELD TRIPS

For additional field trips held in conjunction with meetings, see those items marked with an asterisk under meeting calendar.

Oct. 7-10—ROCKY MOUNTAIN ASSOC. GEOL., field trip of Cretaceous of western Colo., a Cretaceous symposium of Colo. Write: Kretz, 722 Patterson Bldg., Denver. Guidebook.

Mid-Oct.—TRI-STATE GEOL. FIELD CONF., field trip of Cambrian & Ordovician of Driftless area, SW Wisc.; write: Cline, Univ. Wisc., Madison, Wisc.

Oct. 15-17—NEW MEXICO GEOL. SOC., general geology of West Central New Mexico; write NMGS, Box 27, Socorro, N.M. Guidebook.

Oct. 17-18—NEW ENGLAND INTERCOLL. GEOL. CONF., field trip to cover Taconic sequence in W. Vt., Vt. marble belt, and Foreland sequence E of Lake Champlain; write: John B. Lucke, Univ. Conn., Dept. Geol., Storrs, Conn. Guidebook.

Oct. 18—ILLINOIS STATE GEOL. SURV., field trip of Coal Measures of Washington Co., Ill.

Oct. 24-25—CAROLINA GEOLOGICAL SOC., ann. field excursion, Albemarle, N. C., dealing principally with rocks of the Carolina Slate Group. Write: Prof. E. W. Berry, Dept. of Geology, Duke University, Durham, N. C.

Nov. 5-8—WEST TEXAS GEOLOGICAL SOCIETY, field trip to Val Verde Basin of Terrell, Pecos, and Val Verde Counties, Texas. Write: E. L. Dillon, Box 1509, Midland, Texas. Guidebook.

Recent Additions to the Committee of 1000 for AGI-1959*

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** For previous lists of members of the Committee of 1000 for AGI—1959, see GeoTimes Jan.-Feb., p. 22; March, p. 17, May-June, p. 11, July-August, p. 11, and September, p. 18.*

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Subscriptions: GEOTIMES is distributed to members of supporting Member Societies as a part of their society membership. Non-member rates—U.S.A. and Possessions, Canada and Mexico, $2.00 per year; elsewhere, $2.50 per year. Second class postage paid at Washington, D. C.

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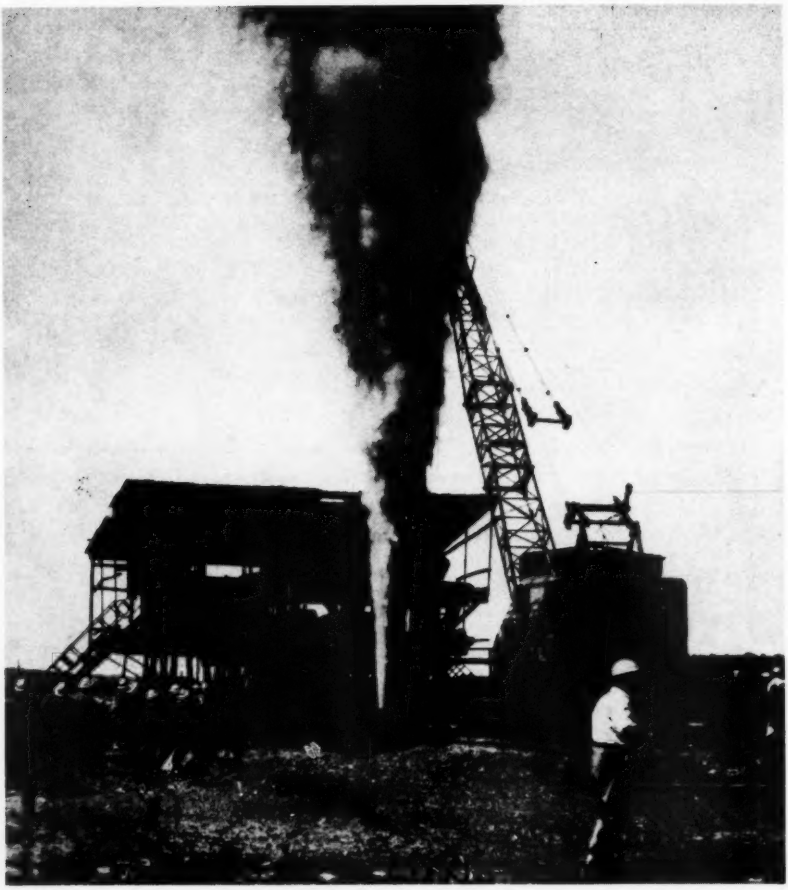

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The Cornerstone

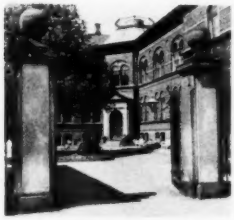
The Duluth Conference for Teaching Resources Development in the Geological Sciences of this past summer laid the cornerstone for a "new look" in geological education at pre-college levels and the public understanding of geology and geoscientists. Whether the cornerstone grows into a structure which will be a thing of pride and satisfaction to the profession will depend in large measure on the concerted efforts of the profession itself.

The Duluth Conference was of signal importance in geological education, for never before had such an assemblage of talented people directed its full and undivided attention to the problems of teaching geology. For six weeks a group of 30 teachers and scientists pooled its broad experiences and directed its full energies to consideration of what in geology should be taught, how it should be presented and what resources should be used to put it across.

The sourcebook and reference book which will ultimately come out of the conference are intended primarily for use in teaching geological subject matter in science courses at grade levels 7-8-9. The materials can also be adapted downward to meet the needs of the elementary school science teacher or upward for inclusion where appropriate in high school science courses. There is little doubt but what some Duluth Conference developed concepts will find their way into college-level elementary geology courses.

Conceived by the AGI Education Committee, the Duluth Conference was developed by the Institute in cooperation with the University of Minnesota, Duluth, aided by grants from the National Science Foundation. To UMD's Provost R. W. Darland go sincere thanks and appreciation of the geological profession for the excellent facilities, staff support, and genuine interest in the conference on the Duluth campus. The success of the project was due in very large measure to skillful planning and understanding leadership of the Conference Director, Dr. Robert L. Heller, Chairman of the UMD Geology Department.

The Duluth Conference was a start—a good start on the big and complex task of broadening public awareness in geology. Where we go from here depends on you—the geological profession.



OUR COVER

Mineralogisk Museum in Copenhagen is the official headquarters of the Organizing Committee for the XXI International Geological Congress. See page 51.

The AMERICAN GEOLOGICAL INSTITUTE is a non-profit professional service organization established and managed by the scientific societies in the fields of geology and geophysics in cooperation with the National Academy of Sciences-National Research Council. It is the instrument of the profession serving and advancing the welfare of the geoscientist in matters relating to education, professional responsibilities and government relations. It is an active member of the Scientific Manpower Commission. It also functions in the stimulation of public education and awareness of the earth sciences, through career literature, the scouting program and other channels of communication.

GEOTIMES is the news magazine of the geological sciences. It reports on current events in the earth sciences, public education and public relations efforts throughout the profession, as well as appropriate legislative and governmental issues. It announces scholarships, fellowships, publications and new developments. It provides a forum for discussion of timely professional problems, and affords a common bond between the many specialized groups within the earth sciences

GEOLOGY IN SWEDEN

BY PER GEIJER [1]

Among those planning to attend the International Geological Congress meeting in Copenhagen in 1960, many expect to take part in excursions in Sweden. Exactly half a century earlier, Sweden alone acted as host to the Congress, a feat that now, with the greatly increased number of participants, would be difficult to repeat. It was the writer's privilege to assist in the guiding of several Congress excursions at that occasion, and he retains in vivid and grateful memory his impressions from this contact with leading geologists from all the corners of the Earth.

To the participants of the 1910 Congress there was issued a colored mark, to be put on mail from the meeting, which may serve as a pictorial introduction to Swedish geology (see photograph). The picture is from the archipelago of Stockholm, and the Latin text below it may be translated thus: "Out of the waves arise again the rocks striated by the ice." Thus are brought out some of the salient geological features of the country: the solid Precambrian bed-rock, scoured by the Pleistocene ice, and the post-Glacial uplift of the land.

As Sweden forms part of the old shield of northern Europe, its rock surface is predominantly made up of Precambrian rocks. For the most part, these have passed through at least one period of orogenesis, with folding, intrusions, and metamorphism. The study of the Precambrian—hampered by an extensive drift cover—has followed very much the same lines as has such work the world over, aiming at unraveling the complicated stratigraphical and structural tangle and seeking to establish the main geological events and their relative ages. Few absolute age determinations are as yet available, but there is ground for hope that a reasonably useful time scale will be fixed before long.

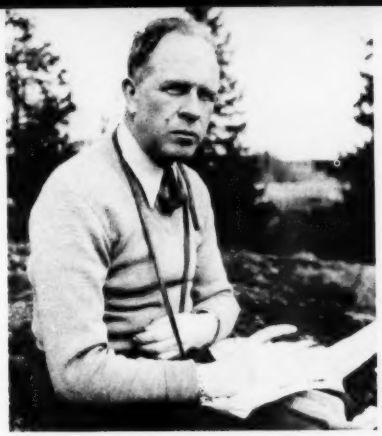
Since most of the iron and sulfide ore deposits of the country are Precambrian in age, their study, as regards both the genetic interpretation of the deposits and their complicated deformation, is closely interrelated with that of the Precambrian as such.

[1] Per Geijer, Agnev 5, Djursholm I Sweden.

INTEREST IN CAMBRIAN OIL SHALE

On the Precambrian basement there rest, in certain areas, erosion remnants of Lower Paleozoic sediments, Cambrian to Silurian, in approximately horizontal position; such rocks also build up the islands Oland and Gotland, in the Baltic. The study of the stratigraphy and paleontology of this sedimentary sequence has long—in fact, for almost two centuries—formed one of the most important branches of the geological sciences in Sweden. In recent years, special interest has been aroused by the Cambrian oil shale and its low but regular uranium content—both from a practical point of view and because of the possibility of obtaining an absolute dating of a well-defined stratigraphical horizon.

In contrast to the largely undisturbed situation of the Cambro-Silurian sediments elsewhere in Sweden, the western margin of the northern half of the country forms part of the Caledonian orogenetic zone of Scandinavia, the western part of which is in Norway. The enormous overthrusts that



Facing Page: Reproduction of the postmark used in 1910 when Sweden was host to the International Geological Congress (see text).

Above Left: Professor O. H. Odman, one of the leaders of the excursions A27 and C22.

Above Right: Two leaders of popular Congress excursions in Sweden, Professor N. H. Magnusson (left) (excursions A26 and C21) and Professor Harry von Eckermann (C27) studying the rocks at Alno.

This article is the first in a series of five on the geology and geologists of the Nordic countries that will be hosts to the geologists of the world attending the XXI International Geological Congress, Copenhagen, August 15-25, 1960.

can be traced in this zone constitute one of the most remarkable features in the geology of Sweden.

Only in southernmost Sweden does one encounter Mesozoic sediments (and small patches of Paleocene). This is in the boundary zone of the shield. Sedimentation has encroached but little on the peneplane of the Precambrian, and thick sediments are only found in the southwesternmost part where step-faulting has brought down the basement to more than 2000 metres below sea-level. The Rhaetic-Liassic sediments include thin coal seams, the only such in Sweden, and have furnished material of great paleobotanical interest. Of other features may be mentioned the thick sediments of the Upper Cretaceous (Senonian and Danian).

All Sweden has been covered by Pleistocene glaciation. Therefore the products of the pre-Glacial weathering have been swept away, except in a few places where local conditions have caused it to go particularly deep, and most of the country is covered by Glacial drift. Prominent features of Glacial origin are the oses (eskers) deposited by the melting-water rivers of the retreating ice. The considerable uplift of the country in post-Glacial time has brought above sea-level the clays deposited during the retreat of the ice (varved clay) and later. Of the manifold aspects of the Quaternary in Sweden, those that may deserve special mention here as subjects of study are the following: the retreat of the last glaciation which is studied chiefly by varve chronology according to G. De Geer; the post-Glacial changes of level, with their interference between land uplift and eustatic changes of sea-level; and the post-Glacial climate history, particularly as recorded in the sub-fossil vegetation; in this case the pollen analysis, developed by L. von Post into an efficient scientific tool, has played a dominant part; of later years, C_{14} age determinations have furnished welcome absolute data. The Quaternary deposits are of the greatest practical importance as the base of agriculture and forest growth, raw materials, the source of much of the ground-water used, etc.

Geological Society Formed in 1871

Most of Sweden is sparsely settled, and the number of the people is small compared to the extent of the country. It is

(Continued on page 42)

GEOLOGICAL EMPLOYMENT
—*present and future*

by

JOSEPH L. GILLSON[1]

There has been a slump in employment of geologists, both of the new and recent graduates, and even of older and more experienced men. This condition naturally has had a tendency to discourage students who are planning their careers in some phase of geology. The current situation stems from several causes which include an overproduction of many of the base metals, an end to the intensive search for uranium, an overproduction of petroleum which has caused a reduction in exploration, a reduction in appropriations granted federal and state geological surveys, and a general period of "belt-tightening" on the part of employers who are just recovering from a period of recession, which was fortunately short-lived, but severe. Similar employment outlook problems of mining engineers were reported recently in the New York Times (August 30, 1959, page 1, section 3, *Engineers Steer Away from Mines.*)

Unfortunately the supply of capably trained scientists and engineers cannot be turned on and off like a faucet.

The effect of these cyclic manpower "booms" and "recessions" is felt very specifically by the individual geologist, geophysicist and mining engineer who one year will be riding high and the next year walking the streets, or will be uncertain as to the future of his career. The effects of the cycles on the standards of the profession are quite devastating. When jobs are few and candidates are many, industry, the major employer of geoscientists, raises its recruiting standards and for the most part hires only applicants who have been adequately trained to the Masters and Ph.D. levels. On the other hand, when there is a boom in exploration, industry enters the recruiting market with a bang, often hiring students with less than minimal training and often without particular regard to quality of training. At times when there is an oversupply of manpower in a given field, it is usually the case that fewer students train for careers in that field. Experience has shown, however, that such periods of low enrollment are usually followed 5 to 8 years later by a period in which there are inadequate numbers of men, adequately trained to the Master's and Ph.D. levels, to meet current demands. Conversely, large crops of students attracted to a field in which there is a strong demand and bright prospects of a good paying job have in many instances tended to glut the manpower market. This is particularly disastrous when such an oversupply is in phase with unfavorable economic factors. Scientists and engineers trained for petroleum and mineral exploration are today the victims of this kind of squeeze. Although the profession does not define minimum standards of professional training, it is inescapable that a significant portion of those hired in periods of intense recruiting are in reality sub-professional. The result is a general downgrading in the adequacy of training of the profession as a whole.

This article by Dr. Gillson is the second on the subject of geological employment, present and future. The first, by AAPG President Weeks, appeared in GeoTimes, Sept. 1959.

EDUCATORS INVOLVED

Educators are enmeshed in the cyclic gyrations of manpower supply and demand and along with industry contribute to the amplitude of the cycles. Respond-

[1]JOSEPH L. GILLSON, Chief Geologist, E. I. duPont de Nemours & Co., Wilmington, Del., President, Society of Economic Geologists, President-Elect American Institute of Mining, Metallurgical and Petroleum Engineers, and a Past President of AGI.

ing to the prospects of easy jobs for men of minimum preparation, some schools may be overstimulated and permit the enrollment of students to grow unchecked thus over-taxing the facilities and staff. Some departments may sacrifice some of the sound requirements of an adequate professional education and to provide the bare technical education that permits graduates to enter the profession with only sub-professional or technical qualifications. The time lag in correcting such relaxed standards and lowered objectives is unfortunately significant.

The geological profession itself may be considered by many as the principal culprit in allowing the cycles of employment to oscillate freely without any attempt to modulate the extremes. The geologists have shown great reticence in considering their professional status and the educational requirements leading to professional adequacy.

Certainly today there is a need for concerted action on the part of educators, the employers of the geoscientists and the profession itself in analyzing and seeking remedies for the cyclic employment problem and the many attendant problems which it creates.

Career Outlook Today

But what about the outlook of the students of today? Students planning their long course of study must look at long term trends, not just the shorter cycles. Fortunately the demand for capable, adequately-trained geologists and geophysicists remains essentially strong in the face of the cycles which affect the profession as a whole.

The long term trend in demand for well-trained and competent geologists is rising, not only because of the explosive growth in the population requiring a much larger supply of all consumer goods, but especially because of the even more rapid growth of technology requiring metals, refractories, insulating materials, new fuels and other materials with properties not previously available, or needed. There has been a burst of requirements for uranium, for lithium, for boron, now for columbium and other high temperature metals; next year it may be for scandium, or cesium, or yttrium. Meanwhile the enormous growth in the number of automobiles, and the changes in our living habits have greatly accelerated the need for such ordinary things as sand and gravel, lightweight aggregates, gypsum and fluorspar. Engineering and groundwater geology are expanding fields of opportunity. There are increasing opportunities for basic research in the challenging problems of the earth sciences.

In the writer's opinion the man considering a phase of the geological profession, must go into it because he likes the work, not because he thinks he can make more money as a geologist than say a sanitary engineer, or a dentist. One does well in a field of work which is enjoyable, not a drudgery. Fortunately the geological field is broad; one with a mathematical aptitude finds rewards and enjoyment in some phase of geophysics, of crystal structure or geodesy; for him who enjoys physical chemistry there is the whole field of mineralogy and petrology, and in organic chemistry comes the new fields of geochemical research. If one enjoys biology, or botany as well as geology, the broad fields of paleontology and paleobotany are open for basic and applied research.

Industrial Minerals

The wide and broadening field of industrial minerals in which the writer has had the bulk of his professional experience requires a knowledge not only of the economic geology of a great variety of minerals, but a knowledge of, and an interest in minerals beneficiation, or, as it used to be called, ore dressing. Most of the industrial minerals have to be beneficiated to be useful or acceptable by the manufacturers who use these products. For some uses, the beneficiation has to be more thorough or complete than for others. A man seeking employment with a company producing talc, or bentonite, or feldspar, or asbestos, or pumice, or perlite must have an interest and training in the preparation and quality requirements for these raw materials. He must know something about grinding, dust separation, air classification, yes, and even how to connect the wires on a motor generator set, and keep a diamond drill running. Many of the producers of these minerals do not require the services of a geologist who knows only how to follow an outcrop and read a geological map, but they have a real demand for a man who has supplemented his geological training with engineering courses and has been out beyond railhead, and if something broke down, he could get it going again.

Many positions are open to men who understand mining taxation, percentage depletion, and the figuring necessary in mine evaluation and such men must also know what constitutes ore and quite a little about costs of production.

(Continued on page 40)

Geological Survey Undertakes Concentrated Investigation of Montana Earthquake

The U. S. Geological Survey is making an all-out effort to investigate as many problems as possible connected with the recent earthquake in Montana. More than 25 geologists, geophysicists, hydrologists, and geochemists have been sent to the area most affected by the quake.

Two geological field parties were mapping in the area when the earthquake occurred. Irving J. Witkind was in camp overlooking Hebgen Lake; Jarvis B. Hadley was farther down the Madison River at Ennis. GeoTimes is privileged to have first hand accounts of on-the-spot observations by these two U.S.G.S. men.

In the first days after the quake, Witkind and Hadley served as ambulance drivers and emergency radio operators helping the Forest Service rescue injured and others stranded because of the landslide in the Madison River gorge below Hebgen Lake. According to Hadley, more than 200 persons were rescued by the Forest Service; both he and Witkind have expressed high praise for good work by the Forest Rangers.

Seismological data about the earthquake are being gathered by the Coast and Geodetic Survey and representatives of the Seismological Society. These data will appear in the bulletin of the Society.

The Survey men working on the earthquake, in collaboration with representatives of the Coast and Geodetic Survey, Seismological Society, Forest Service, Corps of Engineers, Park Service, and Highway Department are planning a comprehensive report on the earthquake that will discuss such diverse problems as:

1. The area immediately affected and extent of the damage;
2. A history of earthquakes in this seismically active area;
3. The new fault scarps and the tilting of the floor of Hebgen Lake;
4. Late Pleistocene and Recent faulting in the region;
5. Landslides and damage to highways, dams, buildings, and other structures;
6. Changes in surface water and ground water regimen;
7. Changes in chemistry of the water along and near new faults;
8. Fluctuations in level of surface water and ground water at recording stations throughout the United States, attributable to the earthquake;
9. Changes in quantity of water discharged by geysers, and changes in chemistry and thermal energy that can be inferred or measured;
10. Possible changes in depth and position of the epicenter during the period of continued tremors.

The water in Hebgen Lake is turbid as a result of the quake; if it clears before weather becomes too cold, Survey geologists adept at skin diving will explore the lake floor to study bottom sedimentation and erosion effects.

Individuals engaged in these studies express hope that most of their manuscripts can be completed by the first of November and sent on the way toward early publication. A special report on the earthquake observations and studies is being scheduled at the Pittsburgh meeting of the Geological Society of America, Nov. 2-4.

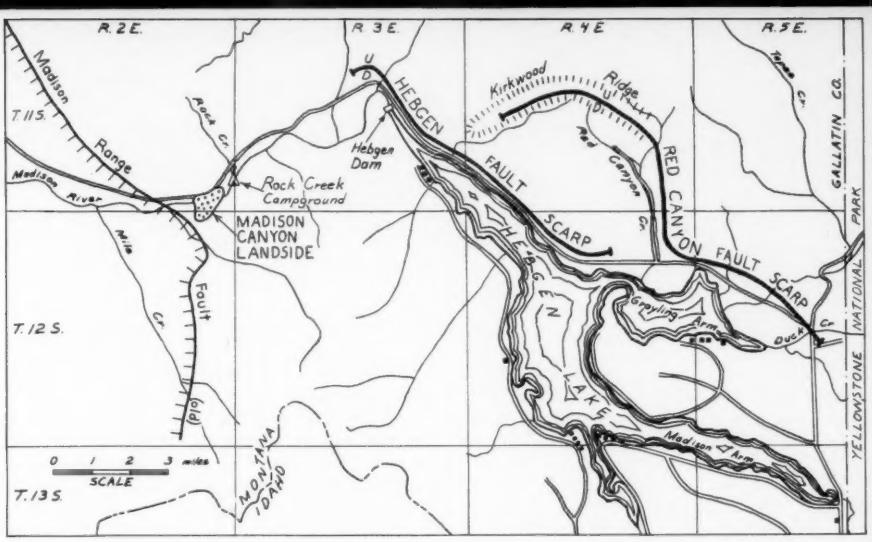


Figure 1. Map showing new fault scarps in Hebgen Lake area.

THE HEBGEN LAKE EARTHQUAKE

by IRVING J. WITKIND [2]

The surface effects of the earthquake that rocked southwestern Montana August 17 and 18 were centered at Hebgen Lake, and I propose that the earthquake be named the Hebgen Lake earthquake. I had been mapping that area for the Survey and was camped only a mile north of the Lake when the earthquake occurred. I am convinced that the epicenter of this earthquake was directly under my trailer and no deeper than a few yards; not 20 miles to the southeast and 20 miles deep as reported by the seismologists!

The earthquake occurred about 11:40 PM, August 17. The first shock was the most severe one and, thinking back, I estimate its duration to have been somewhere between 10 seconds and 1 minute. This first tremor was followed by a series of subsequent shocks of lesser intensity at about 5 minute intervals.

My first reaction to the shaking was that my trailer had broken loose from its moorings and was carrying me downhill! I was neither cool, calm, nor collected as I scrambled to the door to escape from my run away carriage. But outside, on allegedly terra firma, I found the trees were swaying but no wind blowing. Then I realized what had happened.

The geologic effects of the earthquake are several fold, chiefly: new faults, tilting of the floor of Hebgen Lake, landslides, and changes in water occurrence.

The position of the new scarps of faults that were formed are shown on the accompanying map (fig. 1). These are reactivated old faults belonging to one of the major sets of faults in the region. Views of the scarps are given in figures 2 and 3. About midnight I left my trailer to drive around the countryside and see what had happened. I discovered my access road had been broken and displaced by a fault scarp 15 feet high. The main highway also was displaced, and an automobile travelling south drove off the scarp and overturned.

The hills north of Hebgen Lake consist of folded Paleozoic and Mesozoic sedimentary rocks cut by both reverse and normal faults. The hills west of the lake and the canyon below consist of Precambrian crystalline rocks. The scarps of the new faults are near and parallel to the old normal faults that already had been mapped, but they are formed in alluvium, colluvium or other surficial deposits and are difficult to trace in the bedrock hills. At places the faults separate surficial deposits from bedrock. Although manifested at the surface only by displaced surficial material, it is clear that at depth the faults extend into the bedrock, and that the new scarps represent renewed movement on old faults. Displacement on the faults is almost en-

[1] Publication authorized by Director, U. S. Geological Survey.

[2] IRVING J. WITKIND, U. S. Geological Survey, Federal Center, Denver, Colorado.

tirely vertical; the horizontal displacement in few places is more than a few inches.

In addition to the conspicuous fault scarps, all of which dip south and are 3 to 20 feet high, the faults are marked by a series of open fissures. These have jagged outlines; they gape from 1 inch to about 2 feet at the surface and are 1 to 10 feet deep. The length of individual cracks ranges from a few feet to a few tens of feet. Similar cracks in the alluvium along the shores of the lake served as vents for sand and gravel boils, some as much as 50 feet long, 20 feet wide and 12 feet deep.

As a result of the faulting, the floor of the valley containing Hebgen Lake has been tilted northeastward. The Madison Arm of the lake (fig. 1) has emerged whereas the northeast shore has been submerged. The exact amount of shift is not yet known partly because we await new precise leveling, but also because it is difficult as yet to tell displacement attributable to the faulting from displacement attributable to landsliding that resulted from the faulting. It appears though that the northeast shore of the lake has been submerged by about 10 feet and that the southwest shore has emerged about an equal amount. Figure 4 is a view of the emergent southwest shore of the lake; figure 5 shows the submerged northeast shore where a landside has engulfed part of the highway.

Hebgen Lake, formed in 1915 when the dam was built, is less than 100 feet deep. As a result of the shaking the lake water still is very turbid but plans are being made to survey the floor of the lake for any changes attributable to the earthquake.

In an accompanying article, Hadley describes details of the tremendous landslide that dammed the Madison River—the slide that caused most of the casualties and still is a matter of some apprehension because of flood hazard. Many smaller landslides were caused by the shaking; when these have been studied we may be able to relate their distribution and other habit more directly to the faulting.

Changes in occurrence of surface water and ground water as a result of the faulting and shaking are being studied by hydrologists and geologists of the Geological Survey's Water Resources Division. Springs, streams, and the lake have become clouded with exceedingly fine-grained sediment and the condition has persisted 3 weeks to the time of this writing.

THE MADISON CANYON LANDSLIDE[1]

by JARVIS B. HADLEY[2]

The most dramatic and disastrous effect of the Hebgen Lake earthquake was a great landslide in the canyon of the Madison River six miles below Hebgen Dam. Thirty-five million cubic yards of broken rock slid into the canyon in less than a minute, covering the river and highway for nearly a mile to a depth of 100 to 300 feet. Water impounded by the slide formed a lake which, three weeks after the slide, was 175 feet deep and extended almost to Hebgen Dam. The slide itself spread upriver to the edge of a campground full of vacationers sleeping in tents and trailers and on the ground (figs. 6 and 7). Most of these people were more or less seriously injured and lost their immediate possessions. A number of campers as yet unknown had stopped along the river bank farther downstream and were immediately engulfed in the slide.

The magnitude of the slide is dramatic enough, but it is all the more surprising that it occurred 5 miles from the nearest of the faults that were active during the quake and 8 or 10 miles west of the area of greatest surface disruption. We could find no evidence of renewed movement on nearby faults during the earthquake. We did find much evidence, however, of long standing conditions favorable for sliding, which were effectively touched off by the quake.

The configuration of the Madison River canyon where the slide occurred is shown in figure 6. The walls on both sides are steep, those on the south reaching 1,300 feet above the river, in part rocky but mostly thickly forested. Those of the north are higher, mainly rocky slopes with many cliffs reaching 2,000 to 3,000 feet above the river.

On both sides are pre-Belt crystalline rocks. About one-third of the part that slid from the south wall of the canyon consists of fine-grained dolomite that forms steep bare slopes immediately west of the

[1] Publication authorized by Director, U. S. Geological Survey.

[2] JARVIS B. HADLEY, U. S. Geological Survey, Federal Center, Denver, Colorado.

Figure 2. New scarp of Red Canyon fault where a road has been displaced. The Survey camp was in the aspen grove at upper left.

Figure 3. New scarp of the Red Canyon fault as it is typically exposed in the forested hills north of Hebgen Lake.

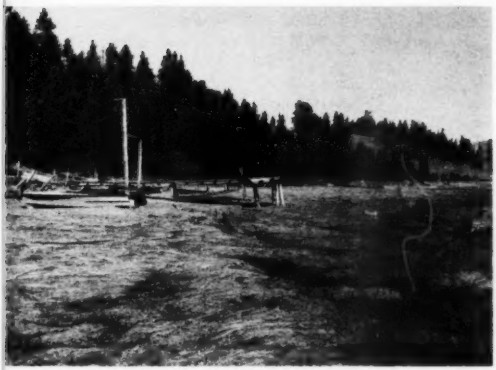


Figure 4. Emergent southwest shore of Hebgen Lake. Water weeds laid flat by the rapidly receding water.

Figure 5. Submerged northeast shore of Hebgen Lake. The present shore is about 10 feet higher than the old one in this area.

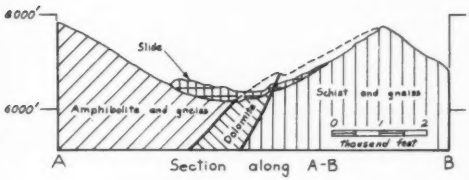


Figure 6. Geologic sketch map and cross section of the Madison Canyon landslide.

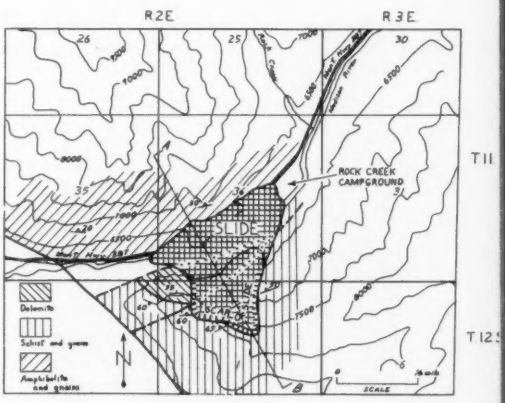


Figure 7. View upstream across the upper end of Madison Canyon landslide to lake formed by damming the Madison River.

Figure 8. Scar of the Madison Canyon landslide.

slide. This rock formed most of the lower part of the slide slope. The other two-thirds of slide area consists of well foliated, micaceous schist and gneiss. In part it is highly sheared chlorite and sericite schist containing abundant quartz veins. The less foliated gneiss is hard, biotite-quartz feldspar gneiss with some massive lime-silicate gneiss adjacent to the dolomite. A zone of much sheared and altered rock 100 feet wide occurs within the schist and gneiss in the western part of the slide scar. Exposures in the slide scar as well as the material on the slide itself show that the schist and gneiss were weathered and partly decomposed to depths of 50 to 100 feet on the upper part of the slope.

Foliation, shear surfaces, and minor faults in the schist and gneiss in the slide area trend east-west to east-northeast, dip 45° to 70° north toward the canyon, and served as slip surfaces for the sliding. A little west of the slide, probably across a fault, attitudes of the foliation change abruptly and dip steeply southward into the ridge.

The dolomite is a wedge-shaped body, widest at the west edge of the slide area and tapering eastward along the base of the ridge. It also tapered upward for the southern boundary dips somewhat more steeply northward than the slope. Bedding and shear surfaces in the dolomite just west of the slide dip north 45° to 65°, changing westward to steeper more easterly dips.

The north wall of the canyon consists of amphibolite and gneiss whose layering and foliation dip north, producing a far stabler slope than that on the south wall. Joint-bounded blocks as much as five feet in diameter were dislodged from talus and bedrock at many points and some pinnacles were loosened, but no mass movement occurred on the north side of the canyon.

The slide started at the ridge crest on the south wall 1,300 feet above the canyon floor (fig. 8). It moved north across the canyon, about 800 feet wide, rose 400 feet vertically along the north wall of the canyon and spread upstream nearly a mile from its starting point. About 90 acres of slope went down, covering an area of 135 acres with slide debris averaging 150 to 175 feet thick. A very rough calculation of the volume of debris suggests that the consolidated rock on the slope that moved was 150 feet deep in many places and perhaps 200 feet deep in the deepest part. The distribution of slide debris shows that it descended in a remarkably orderly manner; the dolomite on the lower face of the original slope forming the forward edge of the mass, was followed by the lime-silicate gneiss and finally the schist. Much of the dolomite and lime-silicate gneiss is in blocks 5 feet and larger; the schist and gneiss formed finer debris, mostly less than 1 to 3 feet in size. Material from the shear zone formed a fine-textured rock-flow which produced a flow pattern on the tail of the main slide mass.

Although most of the sliding probably occurred within a few minutes after the first and strongest shock, the configuration of the slide mass shows clearly that the western part, whose original slope averaged 37° and was locally 45°, moved much faster than the eastern part whose slope was 25°. The high velocity of the western part carried debris to the highest point of the slide mass, 400 feet above the river level, piling it in a newly unstable position so that some subsequently slid back southwestward down the valley. Part of the water scooped from the river was pushed upstream in a wave that inundated the campground and left a swash mark at the edge of the slide 100 feet above the valley

floor. A similar but lower downstream wave reached a terrace 15 feet above normal water level and stranded fish in the sagebrush. Broken tree trunks were carried ¾ mile down the river channel. This evidence, coupled with the fact that considerable water went over Hebgen Dam from seiches on the lake shortly after the quake, gave rise to an early but erroneous report that a flash flood had reached the lower part of the canyon before the slide. Several survivors who were near the edge of the slide reported that just before the arrival of the water and rocks a violent air blast swept over them, overturning trailers and stripping off clothing. A coating of fine sand and mud was plastered on the southwest side of trees.

The eastern part of the slide mass shows much evidence of slower movement. Its surface is less disrupted; trees, although mostly uprooted, are little damaged and a few remained standing. Large blocks of sod with grass, small bushes, and trees that grew near the crest of the ridge are abundantly scattered in upright position over the surface. In fact this part of the slide so lagged behind the western part that part of it came to rest on the tail of the faster moving mass forming a trough 100 to 150 feet deep more or less accidentally along the buried river channel.

Clearly this part of the south wall of the canyon had been potentially unstable for a long time, because the resistant dolomite at its base had protected the deeply weathered schist and gneiss from normal downhill creep and sliding on a smaller scale. The area east of the dolomite wedge had reached an equilibrium slope. To the west, the dolomite mass was large and strong enough to withstand the shock of the earthquake and the mass of schist above was insufficient to break through it. In between the earthquake presumably weakened the tapering dolomite mass and loosened the millions of tons of weakened schist above it.

Alert to the dangerous possibility of a rapid breach in the slide dam when the newly formed lake spilled over it, a unit of the U. S. Army Engineer Corps was detailed to prepare a spillway half a mile long and 200 feet wide in the trough between the two parts of the slide, cutting down the original high point by 15 feet to prevent the water from reaching Hebgen Dam 6 miles upstream. The floor and part of the wall of the spillway were armored with coarse dolomite debris from the high part of the slide to minimize erosion. The outcome of this effort was yet to be learned as this article was prepared.

ARCTIC GEOLOGY SYMPOSIUM

Calgary
Jan. 11-13

The Third Circular has been issued announcing the development of the program for the First International Symposium on Arctic Geology which is to be sponsored by the Alberta Society of Petroleum Geologists in Calgary, Alberta, Canada January 11-13, 1960. *(GeoTimes, July-August 1959)*

The basic program will feature papers on

(1) Stratigraphy, biostratigraphy and tectonics of the circum-Arctic territories and of the Arctic Ocean "basin".

(2) Economic Geology, oceanography, glaciology and permafrost.

The meetings will feature exhibits of organizations and individuals relating to geology of the Arctic. A polar projection base map is being specially prepared for the symposium. It will encompass the area from the Pole to the 60th parallel of latitude and will be issued at the scales of 1:5,000,000 and 1:10,000,000.

Further information on the Arctic Symposium may be obtained by writing D. W. R. Wilson, *General Secretary, P. O. Box 100, Calgary, Alberta, Canada.*

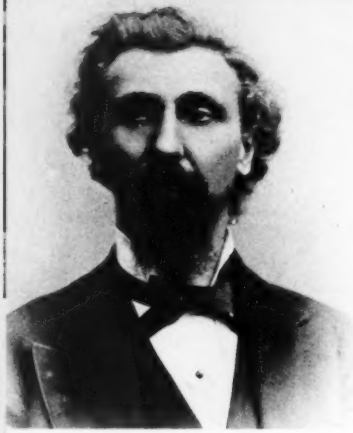
Exploration Geophysicists Meet On West Coast

Los Angeles
Nov. 9-12

The 29th Annual Meeting of the Society of Exploration Geophysicists will open on November 9 in the Biltmore Hotel, Los Angeles. There will be more than 50 papers and addresses on petroleum, mining and research geophysics during the 3½ day program. A general session on Thursday, November 12, will be held jointly with the Pacific Sections of AAPG and SEPM.

Featured on the program will be an address by President E. V. McCollum. James E. White and Frank Press will present a paper, "Progress and Research in Exploration." "Tests of an Airborne Gravity Meter" will be the topic discussed by L. L. Nettleton and L. LaCosta, while R. F. Bauer will talk on "Offshore Operations in California" and related Moho data.

The General Chairman is Flint Agee, Ted Braun is Program Chairman, and Dean Walling is in charge of entertainment.



CYRUS D. ANGELL

Whose oil belt theory paid off

BY WILLIAM S. LYTLE[1]

Cyrus Angell had been reasonably successful in New York State as farmer, school superintendent, politician, postmaster, and merchant. In 1867, eight years after the drilling of Drake's well at Titusville, Angell succumbed to the lure of quick fortune in the oil fields. He sold his business interests and with a borrowed $1,000.00 invested in Central Petroleum Company at Petroleum Center, Pennsylvania.

This venture paid off handsomely and whetted his appetite to try his luck as an independent oil producer.

Of course he knew nothing about petroleum engineering, but then, neither did anybody else. The oil was being found by some of the venturesome. Markets were opening up. Angell thought about how he should proceed.

The lucky ones liked to talk and Angell listened. They had their theories about surface conditions beneath which oil was most likely to be found. If one man told how his luck came from drilling on the flat bottom land along Oil Creek, another told how he drilled successfully far up the steep bluffs of Cherry Run. Those who had drilled dry holes weren't there to warn where not to drill.

Since creekology had not stood the test the producers were anxious to find some method of locating producing wells which would cut down on the large number of dry holes drilled.

There were no consulting geologists. There was the man with the divining rod and for a price he could tell you where to sink your well. Angell had a hunch there might be something to the theory that oil lay in producing "belts". He thought he might follow these belts by means of compass lines, to keep on the axis of the sand deposit as shown by previous development.

Prior to a business disaster in 1866, Angell had purchased a share in the small Belle Island property in the Allegheny River, just below Scrubgrass Station, 25 miles south of Oil City. At the time of his financial failure his interest in the Belle Island property and all else that he had went into the hands of his creditors. With the funds he obtained from his Petroleum Centre oil interest he repossesed his interest in the Belle Island property. Angell leased the property from the company and in 1867 drilled three wells on the Island. These wells proved very productive, each averaging about 100 barrels of crude oil a day, and were to continue producing well for the next three years.

Now that he was financially secure Angell took his time studying the theory that petroleum extised in "belts" of deposits. This theory had been proposed by a number of producers, but no effort had ever been made to prove or disprove it. He postulated that taking a series of facts regarding paying wells in one locality and finding exactly the same series of facts in another paying locality he would have two bearings on the same oil belt. He figured that in any place between these two points he could be certain of obtaining paying wells as had been found at either end of the belt. He concluded that he

[1] WILLIAM S. LYTLE, Assistant State Geologist, Oil and Gas Studies, Pennsylvania Geological Survey.

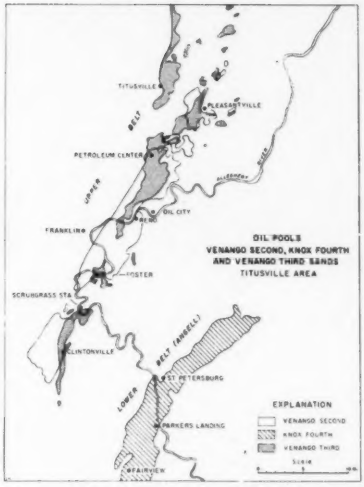
should determine the depth to the producing horizons, the interval between the stratigraphic units, the thickness of the formations, the quantity and quality of oil shows, the color and gravity of oil from the Second and Third sands, and the texture of the two sands.

Angell started with the data pertaining to his own wells on Belle Island and a small rich oil field on the river bank north of the island. He studied the drillers' logs and the drill cuttings, and recalled his own observations made in drilling the wells on the Island. Now he was ready for a duplicate picture. He proceeded up the river to a highly productive territory at Foster Station about nine miles by river from Belle Island. Here, on a 25 acre tract a number of highly productive wells had been operating for several years. The data he found at Foster duplicated that at Scrubgrass. Angell was struck by the fact that the similarity of order, composition, and thickness was not confined to the sand rocks, but marked also the intervening and overlying strata. He discovered that the two fields were producing from the same sand which was lying at approximately the same depth below the level of the river allowing for the fall of the river between the two points. He now had two points in the belt which he knew must be narrow because, by actual development, the two fields he had studied were shown to be small.

Angell Confirmed Belt Concept

Angell now employed a civil engineer and for many months was engaged in running numerous compass lines between Scrubgrass and Foster. After spending a year and a half on this investigation he settled on a line which passed midway between the extremes of development at the two points. In the course of his research he found that the Third sand thins and the supply of oil lessened the further wells were drilled away from the central line of a belt. The sand was dry when the lateral limits of the belt had been reached. The nearer the center line of a belt, the more productive the wells.

The center line of this particular belt lay north, twenty-two degrees east. Angell projected his center line four miles beyond Foster until he again crossed the Allegheny river. There was a development at this point on Porter Island, but it was a considerable distance from the center line and the wells were very small. This fact and the exact similarity of its data with those at Scrubgrass and Foster confirmed what he had found in running his line between the first two points. Continuing his line five miles further it crossed the Allegheny



river at Reno and the best wells in that territory. The data were the same here as at the other three points. Continuing his line to the north he traced it through the heart of the rich oil fields of Charley Run, Wood Farm, and Petroleum Center. He had mapped his belt for twenty miles across the country, crossing the Allegheny four times, traversing every paying development on the river, and landing in the center of what was then the greatest oil basin in the world. This belt was later called the "Upper Oil Belt".

Angell could now visualize the producing horizons 1000 feet beneath him as clearly as if the overlaying strata had been stripped off and the Second and Third sands laid bare. Since no other operator suspected his discovery he proceeded at his leisure. After considerable shrewd negotiations he secured from every property owner on the oil belt between Scrubgrass and Foster a lease on terms liberal to them as to royalty, but including an option clause for the purchase of the land, in fee, at any time within a year, at a stated price. He also made similar contracts for several hundred acres on the belt north of Foster. Before long he took his option, and in a short time owned all the territory between Scrubgrass and Foster, allowing the rest of the leases to lapse since he had no more money to invest.

Highly Successful Deduction

His first well was drilled one and a half miles back from the river and away from all previous development. The well

(Continued on page 45)

Dean McLaughlin (left) and Ernie Dobrovolny discuss some of the science books which were evaluated during the conference.

Group leaders for the conference discuss a mineral identification problem: (l. to r.) Jake Freedman, Charlie Collinson, Don Leet and Gordon Oakeshott.

In the group photograph above are the teachers and scientists who participated in the six-week work session of evaluation and development of teaching resources in geology at Duluth.

First row (left to right)

Grace Muilenburg, *Kansas Geological Survey*
Jennie Livingstone, *Central High School, Tulsa, Okla.*
Sister Paschal, *College of Saint Benedict, St. Joseph, Minn.*
Lois Drury, *Edison Jr. High School, Champaign, Ill.*
Mildred Einzig, *Principal of two elementary schools, Cleveland, Ohio*
Dorothy Vaughn, *Neodesha High School, Neodesha, Kans.*
Helen M. Martin, *Michigan Geological Survey*
Clarence H. Boeck, *University High School, Minneapolis, Minn.*
Konrad B. Krauskopf, *School of Mineral Sciences, Stanford University*

Second row (left to right)

Richard G. Bader, *Dept. of Oceanography, Texas A & M College*
Walter C. Brown, *Ohio Geological Survey*
R. B. Bartholomew, *Cubberly Sr. High School, Palo Alto, Calif.*
Jacob Freedman, *Dept. of Geology, Franklin & Marshall College*
Charles W. Collinson, *Dept. of Geology, University of Illinois*
Jerome Pollack, *Dept. of Geology, Harpur College*
Ernest Dobrovolny, *U. S. Geological Survey, Denver, Colorado*
John Clark, *Dept. of Geological Engineering, South Dakota School of Mines*
Allen F. Agnew, *South Dakota Geological Survey*
Dean B. McLaughlin, *Dept. of Astronomy, University of Michigan*
Harold R. Hungerford, *Kankakee West Jr. High School, Kankakee, Illinois*

Last row (left to right)

Hall Taylor, *National Science Foundation*
Gates Willard, *Manhasset High School, Long Island, New York*
Alan R. Geyer, *Pennsylvania Bureau of Topographic and Geologic Survey*
L. Don Leet, *Division of Geological Sciences, Harvard University*

A pictorial report on

The Duluth Conference

Duluth Conference Director Bob Heller discusses conference details with Secretary Mary Young.

Conference staff members are hard at work: (l. to r.) Joan Nelson, Russ Trentlage, LeAne Rutherford, Carl Anderson, and Phyllis Walsh.

During the summer of 1959 a significant step was taken by the geological profession to improve elementary and secondary school earth science teaching resource material. The Duluth Conference, an integral part of a broader and continuing Teaching Resources Development Program sponsored by the American Geological Institute, brought together more than 30 science teachers and professional geologists for a concentrated six-week workshop on the University of Minnesota, Duluth campus. Supported by a grant from the National Science Foundation, the Conference began what is planned to be a continuing program to improve the teaching of geology in elementary and secondary school science courses.

Present plans call for the material produced by the conference to be published in two sourcebooks, one a subject matter sourcebook, the other a general reference sourcebook. In the subject matter sourcebook basic factual information for various geologic processes will be treated under the headings: important ideas and facts, methods and activities, laboratory and classroom demonstrations, student projects, suggested problems and questions, unsolved geologic problems, teaching aids and annotated references. This sourcebook will also contain supplemental material for use in high school biology, chemistry and physics courses. The reference sourcebook will contain annotated lists of reference books and audio-visual aids, directories of geological surveys and societies and a section on topographic and geologic maps.

A preliminary draft of the subject matter sourcebook is being evaluated by a group of test schools this fall with the hope that final draft can be made available to the schools of the nation by September of 1960.

The organization and purposes of the Duluth Conference were discussed in the March and May-June issues of GeoTimes. Approximately one-third of the participants were school science teachers from widely scattered parts of the country. These were elementary, junior high and senior high school science teachers as well as science supervisors and school principals with science background. The state geological sur-

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Gordon B. Oakeshott, *California Division of Mines*
George M. Wilson, *Illinois State Geological Survey*
W. Taylor Thom, Jr., *Dept. of Geology, Princeton University*
Robert Heller, *Conference Director, University of Minnesota Duluth*
Lorenzo K. Lisonbee, *Science Supervisor, Phoenix School System, Phoenix, Ariz.*
Virgil E. Barnes, *Bureau of Economic Geology, University of Texas*
Joseph M. Keller, *Melbourne High School, Melbourne, Florida*

Missing from photograph:

A. S. Furcron, *Georgia Dept. of Mines, Mining & Geology*
A. R. Socolow, *Pennsylvania Bureau of Topographic & Geologic Survey*

The methods group pictured above was the review and editorial board for all material generated by the task force groups: (l. to r.) Mildred Einzig (elementary school science), Gordon Oakeshott, and Lorenzo Lisonbee (junior and senior high science).

Bart Bartholomew (left) and Konnie Krauskopf experiment with a ripple tank adapted by Bartholomew to demonstrate wave action.

Al Geyer (left) discusses exhibit material with North Dakota State Geologist Wilson Laird, who came to the conference as a member of the Board of Visitors.

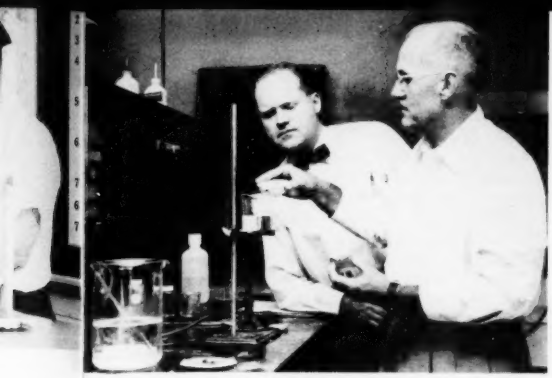
Don Leet (left) and Harry Boeck discuss merits of two demonstration seismographs.

veys were very well represented at Duluth, for the Steering Committee of the Conference recognized important work of the surveys today in the field of public education and their potential role in seeking adoption of materials developed. The care exercised in the screening of participants by the Duluth Conference Steering Committee was clearly evident when the work of the Conference got under way. The participants all were able to contribute knowledge, experience and creative reasoning. The staff organization directed by the Conference Director, Dr. Robert Heller, was most efficient and effective in support of the program.

The first week of the Conference was given over largely to discussions of the objectives and the methods of attack which had been generally outlined by the Steering Committee. Inventory evaluations and the analysis and treatment of the selected geologic subjects was then begun.

At the end of the fourth week of the Conference, a group of geologists, educators and others interested in the work of the Conference were invited to Duluth as the Board of Visitors, to review and comment on the work of the participants. The visitors became acquainted with the work of the Conference and had the opportunity to further discussions of the work on an informal basis with the participants during the second day of the visit while on a field trip to the Mesabi and Vermilion Iron Ranges. The climax of this excursion was a visit to the Ely, Minnesota summer place of A. I. Levorsen where the group enjoyed a Finnish *"Suana"*, swimming, boating and a delicious picnic supper, topped off by a short geologic lecture by Dr. Levorsen under the birch trees by the lakeside. The interlude with the Board

(Continued on page 53)



Alan Agnew (left) looks on as John Clark experiments with the cementation of quartz sand.

Three science educators examine crystal lattice structure of muscovite: (l. to r.) Sister Paschal, Lois Drury, and Gates Willard.

Geologists arguing over how to say it are: (l. to r.) George Wilson, Helen Martin, Hall Taylor and Dick Bader.

Virgil Barnes (l. to r.) and Al Geyer discuss geologic map interpretation with two school science teachers, Joe Keller and Harry Hungerford.

Grace Muilenburg of the Kansas Geological Survey examines a stream table built by Walter Brown of the Ohio Survey who has spent many years lecturing to Ohio school children on geology.

Two school science teachers, Dorothy Vaughn (left) and Jennie Livingstone discuss methods of presentation while Taylor Thom looks on.

THE NORDIC HERITAGE

by ARNE SORENSEN [1]

FREEDOM IS SOMETHING PROVINCIAL—This is what V. Gordon Childe claimed in one of his last books when in his unorthodox ways he tried to find prehistoric reasons for the origins of ancient Greek democracy. In the old world centers of Egypt and Sumer he observed that the king-priests and priest-kings had created the first civilized societies by organizing the work of peasants, artisans, and traveling salesmen. But at a price . . . the price of tyranny. The Greeks in Asia Minor and on the islands later picked up the technical results of these civilizations without having to pay this price.

Something similar could be said about the Scandinavian countries and, for that matter, about the United States and Canada. In these countries outside the sphere of the European imperial centers the fruits of higher civilizations were gained without having to pay the price of serfdom. Denmark, Norway, Sweden, Iceland were never part of the Roman or any other empire. Finland was connected with the Russian empire for only a few generations.

Some decades ago certain historians claimed that especially the democratic institutions of justice had their roots in old Anglo-Saxon and Scandinavian traditions. These theories have become more uncertain with the passing of time, but one fact remains—that prehistoric freedom never perished entirely in the Scandinavian countries, simply because these countries were too far away to become a serious temptation to the Romans or any other imperialists. Scandinavia has had her share of petty tyrants, of nobility, of absolute monarchy, but never anything on the grand scale as was the Roman Empire. Today we visit Rome, Vienna, Madrid, Paris, and several German cities partly because of the magnificent cultural treasures amassed by the imperial powers. There are no such treasures to speak of in Copenhagen, Stockholm or Oslo. In that respect these cities are similar to Cincinnati, Des Moines or Denver.

The common people of the Scandinavian countries were submerged during a few centuries of royal and aristocratic power, but not long enough to make serfdom a natural habit. Therefore, three generations after having abolished absolute monarchy they became entirely democratic, literate and industrialized, while the same generations among the common people of the larger imperial nations became victims of fascism and communism. The reason why Americans always feel more at home with Scandinavians than with any other nations is that they are the same kind of provincial people who never dreamed of building imperial centers. (Here, of course, we find the special reason for a certain kind of American confusion today; how does one carry the kind of responsibilities that normally were those of empires only—without becoming — or wanting to become an empire?).

Freedom in the Nordic countries shows both vertical and horizontal differences. Vertically there are differences between countries and horizontally there is some stratification of classes. Denmark and Sweden have always been independent, and in past centuries built on a modest scale empires which embraced parts of the other Nordic nations. The five Nordic nations today are free and independent. Their concepts of freedom are similar, largely because of common heritage, but still many subtle differences exist. Today these countries display a significant ability to cooperate to their mutual advantage, each respecting the individual rights of the others.

Within these countries, history has also witnessed a development of personal freedom among various groups of people. The academic and business people were first to satisfactorily establish their own role in a democratic state, followed by the farmers and more recently the workers.

The varied bases for the political differences of several generations ago, whether religious or ideological, are of little significance today.

The Nordic countries normally have four main types of political parties: *conservative,* representing business and industry; *farm; labor;* and *liberal,* including "egg-headed" people from a good many different occupations. Frequently the labor parties will be in power, often in coalition with the liberals. Even when the labor parties carry the parliamentary power entirely alone, without such liberal support, socialism does not seem to be around the next corner. The Scandinavian laborites are usually rather shocked when asked if they plan to nation-

[1] ARNE SORENSEN, a Dane, is the author of eight Scandinavian books on modern cultural and political questions. He was a member of the Danish National Resistance Council during World War II. He served in the Danish Parliament and was a Cabinet member of the Liberation Government of Denmark in 1959. Mr. Sorensen is a director of the European Traveling Seminar, Washington, D. C.

alize industry and business. They are not going to kill the goose that lays the golden eggs—but they do not hesitate to tax her! At the same time the conservatives and the farmers have accepted most of the new social legislation to such a degree that they would never abolish the rather elaborate systems of social security that prevail in all five Nordic countries. There is, of course, some grumbling (of exactly the same kind one finds in the United States). Workers will grumble about industry, and industry about workers. City people about farmers and vice versa. But all political parties in the Scandinavian countries face the same election troubles as the Republicans and Democrats in the United States. It has become rather difficult to dramatize the party differencies at election times. If such dramatization goes too far and the voices of the politicians become too loud, people do not take them seriously.

So the Scandinavians have fallen back to provincialism and the great ideologies of the world have very little appeal. This, as in the United States, presents a problem to some degree. It was so much more exciting when people could sing about politics—when the Marxists, the conservatives and the liberals had dreams, poems, and songs that put fire into the souls of young people. This, however, is now a thing of the past; it is not so easy to dramatize the necessity of a new school house, a new bridge, a new highway. The Scandinavians were provincials at the times when the Roman emperor was a god, and they are provincial in times of the world communism.

It is safe to assume that the Scandinavians were not disappointed when they learned that a Russian rocket was first to hit the moon and the first American moon rocket would not come until some future Saturday afternoon. They know well that the Russian moon rocket is just a modern variety of imperial castle and pyramid or temple.

The outstanding achievements of Scandinavian democracy, education and standard of living are too great to be attributed to the genius of these nations. It just so happened that they were left alone and never had to kneel before an emperor. The heritage of the Scandinavian people is similar to that of the Americans. Because these nations were controlled by the people who worked, produce and created these great achievements have not resulted in complacency. The present burden of minds and spirits—how to inspire and create greatness without recourse to the kind of imperial power that kills freedom—is shared alike by Scandinavians and Americans.

CHARLES A. ANDERSON was recently appointed Chief of the Geologic Division of the U. S. Geological Survey to replace W. H. Bradley, who vacated the post to return to geologic research activities. An economic geologist, Dr. Anderson formerly served as Chief of the Mineral Deposits Branch. In his new post he will assume the direction of the Survey's program of geologic investigations, research and systematic mapping. Under the Geologic Division are the following branches: Alaskan, Engineering Geology, Foreign Geology, Fuels, General Geology, Geochemistry & Petrology, Geophysics, Mineral Deposits, Military Geology and Paleontology and Stratigraphy.

MID-CONTINENT MEETING

The Mid-Continent Regional Meeting of the Mid-Continent Council of Geological Societies of the AAPG will be held in the Broadview Hotel, Wichita, Kansas, October 28-30, 1959. The technical sessions will begin Thursday morning, the 29th.

There will be a field trip led by L. F. Delwig on Wednesday, October 28, to study structure and flowage of the Hutchinson Salt member of the Permian Wellington Formation.

A second trip on Saturday, October 31, will study the Beattie Limestone Facies (Wolfcampian, Permian) and their bearing on the cyclic sedimentation theory, with John Imbrie as leader.

The meeting is sponsored by the Kansas Geological Society in cooperation with the Mid-Continent Council of Geological Societies, and the Liberal Geological Society —co-host. For further information, write *Mid Continent AAPG, 308 East Murdock, Wichita, Kansas.*

Gulf Coast Meeting Features—

EMPLOYMENT PROBLEMS PANEL

Houston, Texas
Nov. 11-13

The Ninth Annual Meeting of the Gulf Coast Association of Geological Societies will be held jointly with the Gulf Coast Section of the Society of Economic Paleontologists and Mineralogists, in Houston, Texas, November 11, 12, and 13, 1959, followed by a two-day field trip on November 14 and 15. Headquarters and registration for the meeting will be at the Shamrock Hilton Hotel.

The Gulf Coast Association is composed of the Societies at Beaumont, Corpus Christi, Houston, San Antonio and Tyler, in Texas; Lafayette, Lake Charles, New Orleans and Shreveport, in Louisiana; Jackson, in Mississippi; and Tallahasee, in Florida.

The theme of the technical meeting will be the relation of structure and sedimentation. In keeping with this theme twenty-one papers have been prepared for presentation treating structural and sedimentary studies in their relation to oil and gas accumulation in the Gulf Coast region, including the adjacent offshore areas. A symposium of six papers will deal with the geologic features of the post-meeting field trip areas. The field trip will start along the Gulf Coast at Galveston Island on Saturday, Nov. 14 and will continue eastward to the vicinity of Cameron, Louisiana where the trip will terminate on Sunday evening.

The AAPG Employment Counselling Committee, under the chairmanship of Olin G. Bell has arranged a panel discussion of Geologic Employment Problems at the Houston meeting on Friday evening, November 13th. The panel will consist of six outstanding and nationally recognized leaders in industry, in education, and in related fields of geology.

The past two years or so have been one of those periods when the petroleum industry has been unable to employ its normal sizeable portion of the geology graduates. This has likewise been true in other industries. Thus there has been a surplus of men with degrees in geology available. As a consequence of this condition it now appears that the number of young men entering college who are selecting geology as a major is alarmingly low, thus indicating another impending period of shortage of geologists available for new employments two to five years from now.

The panel will discuss many aspects of the problems of employment and training of geologists and geophysicists, and the opportunities available for them objectively and constructively. The discussion will cover such topics as:

1. The adverse effect of such economical conditions as oversupply of crude oil and reduced production allowables on employment.
2. Planning long range exploration and development programs.
3. The preparation and training of a geologist for his profession; the distinction between a "job as a geologist" and a "career in geology"; the need for men adequately trained and experienced in geology for executive positions in industry.
4. The necessity for continuous expansion of research work, both fundamental and applied.
5. The need and opportunities for highly trained men in the field of education in earth sciences.
6. The necessity for increasingly closer teamwork between the geologist and the geophysicist; the geologist and the petroleum engineer, and with other scientists in exploration and development of oil and gas resources.
7. The opportunities available in related uses of geology; as the search for other minerals, development of water resources, oceanography, and numerous others.

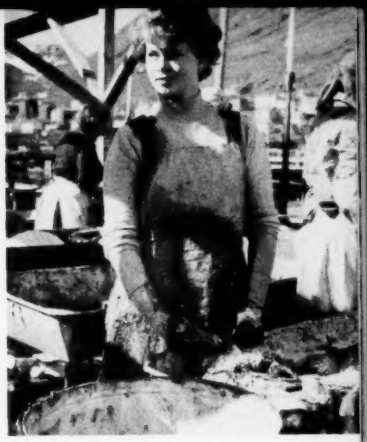
The Gulf Coast Association of Geological Societies joins the AAPG Employment Counselling Committee in extending a sincere and hearty invitation to those interested in a discussion of these problems.

The Gulf Coast meeting will also feature pleasant social features and a program of activities for the ladies.

Further information about the meeting may be obtained by writing OLIN G. BELL, *5519 Jackson St., Houston 4, Texas.*

Engineering Geologist Cited

Joseph D. Myers, Engineering Geologist for the Materials Division of the Arizona Highway Department, was co-winner of the Dr. L. I. Hewes Award in recognition of his work on gathering, standardizing and recording data on highway aggregate sources of Arizona. The Hewes Award is given by the Western Association of State Highway Officials to the engineer (or engineers) who has done the most for highway engineering in the previous year.



A glimpse of

ICELAND

Upper left: A wintertime view of one of Iceland's famous hot springs surrounded by snow.

Upper right: Fishing is Iceland's largest industry. Photographed here is an attractive Icelander salting herring at Siglufjord on the north coast.

In the shadow of the Arctic Circle, Iceland with its 40,000 square miles, is somewhat larger than Ireland (after Britain it is the largest island in Europe); with its population of 170,000 it is one of the smallest nations.

Though situated 800 miles northwest of the British Isles on the edge of the Arctic Circle its climate is nothing like as cold as its name suggests, owing to a branch of the Gulf Stream which nearly encircles the country. The average temperature in January (coldest month) is higher than in New York or 30 degrees Fahrenheit, and the mean summer temperature is 52 degrees Fahrenheit.

Iceland was colonized by Vikings who wanted to throw off the political yoke of Harald the Fair Haired of Norway. Independent, fiery, stubborn, they left their native land to settle in a new one far away. Their descendants have lived in Iceland for nearly 1100 years.

When the first settlers arrived, in 874 A.D., there were no aborigines. We can look back on their history and find no blot of oppression or extinction of a native people. Within a few decades the Vikings had established a code of laws. Their legislative assembly, the Althing, is the oldest existing parliament in the world.

In the 13th and 14th centuries Iceland was united first with Norway and then with Denmark. In 1918, by a special treaty, Iceland was acknowledged to be an independent and sovereign state, in a personal union with Denmark, through a common king. Since June 17, 1944 Iceland has been an independent republic.

The island of Iceland, of course, is well known for its glaciers, volcanoes, hot springs, and geysers, but GeoTimes readers will hear more about these in a later issue. Congress excursion A2 beginning in Reykjavik on August 1 will be devoted to the geology of Iceland.

Most of the people of Iceland live on the plains in the south and southwest where the weather is tempered by the Gulf Stream. Reykjavik, the capital city, has a population of about 70,000 and serves as the center of cultural life in Iceland as well as the seat of government. Reykjavik, in contrast with the capitals of the other Nordic countries, is quite young.

Iceland has almost no trees and its very short summer season limits the variety of agricultural development. Icelandic farmers do raise cattle, sheep, goats and horses.

Fishing, of course, is the principal industry of the island. The nation's fishermen catch over 7,300 lbs. of fish per person in Iceland per year. There are small textile mills in the populated areas. Iceland, once the source of rich deposits of Iceland spar, today has little production of mineral resources.

Tourists going to Iceland will be fascinated by the widely varied scenic beauty of the country. They will be intrigued by historic Thingvellir where the Althing assembled from 930 until the middle of the nineteenth century.

For the student of history and sociology Iceland is of great interest. The origin of the people; their age-long isolation—which has not killed the spirit of enterprise among them, but, on the contrary, seems to have stimulated it; their brave struggle for independence; their culture and traditional mode of life; all have a particular appeal for him.

CONGRESS corner

news and information on the

INTERNATIONAL GEOLOGICAL CONGRESS NORDEN

August 15-25 1960

From the office of Organizing Committee for the XXI International Geological Congress we learn that over 500 geologists from the United States and Canada have actually registered for attendance at the 1960 Congress. These 500 geologists will be accompanied by 300 members of the family or friends. On September 10 manuscripts received for papers to be presented at the Congress numbered 94 from the U. S. and 17 from Canada. Papers are still being accepted for consideration.

Except for several of the more popular excursions, there is still opportunity to register for and to be considered for assignment to a number of the geological excursions listed in the Second Circular. The excursions on which there is still available space will afford opportunities to see some highly interesting geologic localities, scenic areas and interesting cultural features.

If you have not received the Second Circular for the 1960 Congress which contains the description of the field excursions and application forms, you may do so by addressing your request to *Congress Travel, American Geological Institute, 2101 Constitution Ave., N.W., Wash. 25, D.C.*

Congress travelers including Great Britain on their itinerary will be interested in securing the following guide books published by Yorkshire Geological Society, Dept. of Geology, The University, Leeds 2, England (prices include postage):

1. *"A guide to the geology of the district round Ingleborough."* $1.50
2. *"A guide to the geology of the district around Alnwick, Northumberland."* $2.00
3. *"A guide to the geology of the Cliviger Valley, near Burnley, Lancashire."* $1.50
4. *"A guide to the geology of the area between Market Weighton and the Humber."* $2.00.

Other publications of the Yorkshire Society deal with the geology of Northern England and questions concerning this literature may be addressed to J. Hartley, Society Librarian.

Persons planning to purchase or rent a car in Europe will be interested in studying the detailed booklet INFORMATION ON TRAVEL BY CAR IN EUROPE which deals with straight rental, rental-purchase, purchase-repurchase and outright purchase options. It also provides other data on papers, insurance, etc. Prepared for and available free to Congress travelers on request from European Travelling Seminar, 2475 Virginia Ave., N.W., Washington 7, D. C.

For those who will be travelling on a shoestring (or a knotted shoestring) there is the POOR MAN'S GUIDE TO EUROPE, 1959 Edition. Published by Random House, it is a 308 page travel guide by David Dodge written with a delightful sense of humor.

TRAVELER'S GUIDE TO EUROPE'S ART by Jane and Theodore Norman is an index to the paintings, sculpture, palaces and cathedrals to be seen on a tour of Europe, published by Channel Press, Inc., Great Neck, N. Y. $5.00.

To aid in picking up some basic phrases in the languages of the host countries, there is the BERLITZ SCANDINAVIAN LANGUAGES FOR TRAVELERS, 215 pp., 1959, Grosset & Dunlop, New York. The booklet contains phrases and common words in Danish, Norwegian and Swedish with the Berlitz self-pronunciation feature.

LET'S NOT BE IDIOTS

Ancient Athens, the birthplace of Democracy, educated its citizens to be interested and active in that which concerned them all—*politics*. They had a name for those few persons who remained aloof from this common activity, *Idiotes*, or disinterested ones. That then is the origin for the English word, idiot.

These are the most interesting times in the short history of man. Nothing in past history can approximate the products of our science, or the intelligence of our scientists. Man has progressed in all fields, but has accomplished nothing in the realm of politics in over 2000 years, and that is because the world is full of idiots.

For those who would rather be citizens rather than idiots, the following list of *your elected* congressmen is published. Pick your pet subject, taxes, foreign policy, foreign aid, domestic policy, farm program, graft, nepotism, the budget, Fair Trade laws, etc., etc. Then take your stand, for that is your ever loving valuable right, then *write, write, write*. Let them know who you are, what you think, what you feel, and what you are angry about, for an angry citizen is hardly a disinterested one.

Reprinted from RMAG Newsletter

Congress geologists can

MEET THE SCANDINAVIANS

Congress-bound geologists and their families can add immeasurably to their Scandinavian trip by meeting the Scandinavians and getting to know their way of life.

There'll be no problem, of course, in making the acquaintance of Scandinavian geologists at the Congress. But you and the members of your family may want to make contact with other individual Scandinavians—people who share your hobby or some other special interest outside the field of geology. Such contacts, interviews with experts in different fields and on-the-spot demonstrations are easily arranged while you are in Scandinavia and will supply a "human interest" element that you will find both truly enjoyable and worthwhile. Visits to private homes also are possible under the various "meet the Scandinavians" programs, but overnight accommodations are not involved in such arrangements.

Your travel agent can make your meeting arrangements or you can make your own by contacting these offices:

Meet the Danes. National Travel Association of Denmark, Banegaardspladsen 5, Copenhagen.

Find the Finns. Finnish Tourist Association, Mikonkatu 15 A, Helsinki. (Preliminary arrangements also can be made by filling in an application form available from the Finnish National Travel Office, 10 East 40th St., New York 16, N. Y.)

Know the Norwegians. Oslo Tourist Information Office, Rosenkrantzgate 28, Oslo.

Sweden at Home. Stockholm Tourist Traffic Society, Gustav Adolfs Torg 18, Stockholm. (Preliminary arrangements can be made in advance by filling in an application form available from the Swedish National Travel Office, 630 Fifth Ave., New York 20, N. Y.

The oldest of the above-mentioned programs is the "Meet the Danes" service, through which more than 25,000 British and Americans have been private dinner guests in Copenhagen homes since 1945. It was started originally by the Danish Allied Committee in order to take care of the many Allied military personnel who came to Denmark for vacation, but since 1948 it has been run by the National Travel Association of Denmark.

How does it work? In all four countries, the procedure is substantially the same:

Each of the "meet-the-Scandinavians" offices maintains files of hundreds of families, among which there are likely to be families whose professions or interests correspond to your own. These families are pleased to act as hosts for an afternoon or an evening.

After your visit to the appropriate office, an appointment is made. You then receive a form with the name, address, telephone number and the time fixed for the visit with your host, and off you go! There is no charge whatsoever for this service. The families enlisted in these programs open their homes because they enjoy the company of foreign guests. They expect nothing in return.

Naturally, your host family speaks English, so be prepared for a relaxed, friendly visit.

Use the Glossary, and Help To Make It Grow

An Unsolicited Testimonial

by W. ARMSTRONG PRICE

After 2 years of use, *the A. G. I. Glossary* becomes more and more useful and interesting as the months go by. *The Glossary*, to a writer, takes its place alongside such tools as the Atlas, the geologic map and the foreign-language dictionary.

Ways in which *the Glossary* has helped the writer include, first, of course, as a handy reference work of precise definitions and their references, saving trips to libraries and endless searching; second, *the Glossary* helps to organize a piece of research by showing exactly what is and is not established in the literature by adequate definition; again, it makes interesting reading, especially for those who have long since been weaned from textbooks and for whom the new ones are strange. Already *the Glossary* has drawn the writer's attention to gaps in our published store of knowledge, some long-accepted ideas, for example, not having been well formalized; a gap in *the Glossary* means an opportunity to improve the volume by sending in a reference or, if none is found, by publishing a definition. Finally, close scrutiny of the definitions covering a research field may develop a lead for investigation.

One topic that comes to mind in the use of *the Glossary* is: what definitions upon which we rest our science may have been prematurely given a genetic or other subjective basis in a day when data were scarce and concepts generalized?

Use the Glossary!

MANPOWER *in a column —*

By HOWARD A. MEYERHOFF
Scientific Manpower Commission
1507 M Street, N.W., Washington 5, D. C.

The Army's Scientific and Professional Personnel Program has been given an overhauling, and in January 1960 it will be progressively displaced by the Scientific and Engineering Assistant's Program. The new S&EA Program and the old S&PP Program are much like the twins, all of whose differences were just the same.

To qualify for assignment as a scientific or engineering assistant, an enlistee or an inductee must have a master's or a doctor's degree. But a bachelor with 6 months' experience or more in his field of specialization may be accepted in the program. Assignment will depend on need, and it is expected that calls for S&E personnel will range between 1,500 and 2,000 men.

In the halcyon days of the S&PP Program (if those who went through it will accept the adjective) there were 5,000 slots rated Grade A and another 3,000 Grade B positions available. Practically all the latter, and not a few of the former, could have been handled by high school graduates.

With more liberal deferment policies, the number of S&P's has dwindled to 2,700. Further reduction to a maximum of 2,000 will bring the number into line with existing requirements. Army officials assert that the work to which S&E assistants will be assigned will be at the professional level. Commanding officers are admonished that *"emphasis must be placed on minimizing periods when the individual will be required to be absent from his technical job because of routine military duties"*—meaning KP, Grass Detail, and other chores in the strong-back, weak-mind category.

The language of this official instruction brings to mind an early automobile market survey, in which the investigators reported that "there was a rapidly increasing demand for fewer wire wheels." If, however, emphasis is placed on "minimizing" military routine for professional personnel, the new program will have some real value for both the men in it and the Army. How much it will mean to earth scientists is another story. (In two words, not much.)

AAPG RESEARCH GRANTS IN AID

The American Association of Petroleum Geologists has again made a fund available for Grants-in-Aid for support of research in fields of general interest to the petroleum geologist. The chairman of the Grants-in-Aid Subcommittee will receive applications from the date of this notice until January 1, 1960. Anyone working on research projects within the United States of America, which are of interest to petroleum geologists, is eligible for consideration.

All applications and supporting letters will be studied and rated by a qualified subcommittee. Recommendations for grants will then be made by the subcommittee to J. Ben Carsey, Chairman, Research Committee of the A.A.P.G. Those approved will be submitted by him for final decision to the Trustees of the Research Fund and the Executive Committee of the A.A.P.G. Awards will be announced at the Annual Meeting of the American Association of Petroleum Geologists April 25-28, 1960.

As in past years, the Subcommittee on Grants-in-Aid will use the survey *"Research Needs in Petroleum Geology,"* BULLETIN A.A.P.G., Vol. 41, No. 8, pp. 1854-76, August 1957, as a general guide in making recommendations for support of research projects. Within this framework, the qualifications of the applicant, the probability that his work will contribute to new knowledge of petroleum geology, evidence that he can complete the proposed work, and indication that publication will result for the benefit of petroleum geologists in general, will form the basis for making final awards.

Geologists interested in A.A.P.G. Grants-in-Aid should note that only one annual grant will be made during 1960, which is the one advertised in this notice. They should also note that at the present time grants are not made to pay the grantee's salary, salary for assistants, or the purchase of physical capital equipment. Experience over the past several years has indicated that the limited research funds of the A.A.P.G. achieve their maximum benefit in covering field expenses, travel expenses, purchase of necessary expendable items and similar requirements to carry out research. Additional information can be obtained from any member of the A.A.P.G. Research Committee.

Application forms may be obtained from A.A.P.G. Headquarters, Box 979, Tulsa,

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FIELD CONVERSION TABLES

Contour Spacing From Slope Angles

Contour Interval Ft. =	1	2	5	10	20	25	50	100
Slope or Dip Angle in Degrees	Contour Spacing in Feet on the Ground							
1	57.3	104.6	286.4	573	1046	1432	2864	5729
2	28.6	56.3	143.2	286	563	716	1432	2864
3	19.1	38.2	95.4	191	382	477	954	1908
4	14.3	28.6	71.5	143	286	357	715	1430
5	11.4	22.9	57.1	114	229	285	571	1143
6	9.5	19.0	47.5	95	190	237	475	951
7	8.1	16.3	40.7	81	163	203	407	814
8	7.1	14.2	35.5	71	142	177	355	711
9	6.3	12.6	31.5	63	126	157	315	631
10	5.6	11.3	28.3	57	113	141	283	567
11	5.1	10.3	25.7	51	103	128	257	514
12	4.7	9.4	23.5	47	94	117	235	470
13	4.3	8.7	21.6	43	87	108	216	433
14	4.0	8.0	20.0	40	80	100	200	401
15	3.7	7.5	18.6	37	75	93	186	373
16	3.5	7.0	17.4	35	70	87	174	349
17	3.3	6.5	16.3	33	66	81	163	327
18	3.1	6.2	15.4	31	62	77	154	308
19	2.9	5.8	14.5	29	58	72	145	290
20	2.7	5.5	13.7	27	55	68	137	270
21	2.6	5.2	13.0	26	52	65	130	260
22	2.5	4.9	12.3	25	49	62	123	247
23	2.3	4.7	11.7	23	47	59	117	235
24	2.2	4.5	11.2	22	45	56	112	225
25	2.1	4.3	10.7	21	43	53	107	214
26	2.0	4.1	10.2	20	41	51	102	204
27	2.0	3.9	9.8	20	39	49	98	196
28	1.9	3.8	9.4	19	37	47	94	188
29	1.8	3.6	9.0	18	36	45	90	180
30	1.7	3.5	8.6	17	35	43	86	173
31	1.7	3.3	8.3	16	33	41	83	166
32	1.6	3.2	8.0	16	32	40	80	160
33	1.5	3.1	7.7	15	31	38	77	154
34	1.5	3.0	7.4	15	30	37	74	148
35	1.4	2.9	7.1	14	29	35	71	143
36	1.4	2.8	6.9	14	28	34	69	138
37	1.3	2.7	6.6	13	27	33	66	133
38	1.3	2.6	6.4	13	26	32	64	128
39	1.2	2.5	6.1	12	25	31	61	123
40	1.2	2.4	5.9	12	24	30	59	119
41	1.1	2.3	5.7	11	23	29	57	115
42	1.1	2.2	5.5	11	22	28	55	111
43	1.1	2.1	5.3	11	21	27	53	107
44	1.0	2.0	5.1	10	20	26	51	103
45	1.0	2.0	5.0	10	20	25	50	100

EXAMPLE: To find the contour spacing for a slope or dip angle of 24 degrees, with a contour interval of 20 feet, locate line 24 in the left column and number 20 on the top line. At the intersection of these two lines, read the proper value for the contour spacing, which is 45 feet. One may interpolate for values between those shown on the data sheet. For instance, a contour spacing of 96 feet falls midway between 27 and 28 degrees in the left column; hence the slope angle is 27½ degrees.

Oklahoma, or R. W. Landes, Chairman, Grants-in-Aid Subcommittee. Applications should be supported by at least three letters of recommendation by persons acquainted with the applicant's ability and the nature of his research work. Supporting letters should be in the hands of the chairman of the subcommittee by the closing date. All applications and correspondence relative to them should be addressed to R. W. LANDES, *Chairman, Grants-in-Aid Subcommittee, Jersey Production Research Company, 1133 North Lewis Avenue, Tulsa 10, Oklahoma.*

Educational Exhibits Invited

Educational, research, and other nonprofit institutions are invited to exhibit publications and other displays at the Annual Convention of the American Association of Petroleum Geologists and the Society of Economic Paleontologists and Mineralogists meeting in Atlantic City, N. J., April 25-28, 1960. Booths and display panels will be available at no charge. For further information write to DOUGLAS M. KINNEY, *Chairman, Educational Exhibits Committee, 5221 Baltimore Ave., Washington 16, D. C.*

Conversion from Per Cent Grade to Vertical Angles in Degrees and Minutes of Arc

Per Cent Grade	Vertical Angle	Per Cent Grade	Vertical Angle	Per Cent Grade	Vertical Angle
1	00°35'	35	19°17'	68	34°13'
2	01 09	36	19 48	69	34 36
3	01 44	37	20 18	70	34 59
4	02 18	38	20 48	71	35 22
5	02 52	39	21 18	72	35 45
6	03 26	40	21 48	73	36 08
7	04 00	41	22 18	74	36 30
8	04 35	42	22 47	75	36 52
9	05 09	43	23 16	76	37 14
10	05 43	44	23 45	77	37 36
11	06 17	45	24 13	78	37 57
12	06 51	46	24 42	79	38 18
13	07 24	47	25 11	80	38 39
14	07 58	48	25 39	81	39 00
15	08 32	49	26 06	82	39 21
16	09 05	50	26 34	83	39 41
17	09 39	51	27 01	84	40 01
18	10 12	52	27 28	85	40 22
19	10 45	53	27 56	86	40 42
20	11 19	54	28 22	87	41 02
21	11 51	55	28 49	88	41 21
22	12 24	56	29 15	89	41 40
23	12 57	57	29 41	90	41 59
24	13 30	58	30 07	91	42 19
25	14 02	59	30 33	92	42 37
26	14 34	60	30 58	93	42 55
27	15 06	61	31 23	94	43 14
28	15 39	62	31 48	95	43 32
29	16 10	63	32 13	96	43 50
30	16 42	64	32 37	97	44 07
31	17 13	65	33 02	98	44 25
32	17 44	66	33 26	99	44 43
33	18 16	67	33 49	100	45 00
34	18 46				

Conversion from Degrees to Per Cent of Grade

Vertical Angle (Degrees)	Per Cent Grade	Vertical Angle (Degrees)	Per Cent Grade	Vertical Angle (Degrees)	Per Cent Grade
1	1.7	18	32.5	35	70.0
2	3.5	19	34.4	36	72.6
3	5.2	20	36.4	37	75.3
4	7.0	21	38.4	38	78.1
5	8.7	22	40.4	39	81.0
6	10.5	23	42.4	40	83.9
7	12.3	24	44.5	41	86.9
8	14.0	25	46.6	42	90.0
9	15.8	26	48.8	43	93.2
10	17.6	27	50.9	44	96.6
11	19.4	28	53.2	45	100.0
12	21.2	29	55.4	46	103.5
13	23.1	30	57.7	47	107.2
14	24.9	31	60.1	48	111.1
15	26.8	32	62.5	49	115.5
16	28.7	33	64.9	50	119.2
17	30.6	34	67.4		

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III Venezuelan Geological Congress

Caracas
Nov. 22-29, 1959

The Sociedad Venezolana de Geologos (*Society of Venezuelan Geologists*) and the Ministerio de Minas e Hidrocarburos, Direccion de Geologia have announced the third Venezuelan Geological Congress in Caracas, Venezuela.

There will be programs relating to scientific, technical and economic aspects of geology. There will be pre- and post-Congress field excursions of interest to mining and petroleum geologists.

Geologists in the U. S. and Canada wishing information on this meeting may write ANIBAL R. MARTINEZ, *1133 N. Lewis Ave., Tulsa 10, Okla.*

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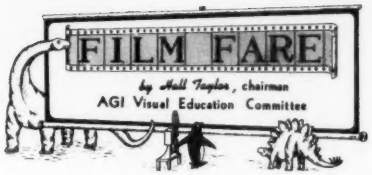

In evaluating teaching resources in the earth sciences, the Duluth Conference last summer gave some attention to the reviewing of visual aids, particularly movies. Most conferees felt that reviews, to be of greatest value to potential users, should not only summarize film content but should also present the reviewer's evaluation of the film's usefulness.

The first aim—summary of content—can be largely objective; the second—evaluation of usefulness—involves a measure of subjective judgment which inevitably will vary with individuals.

Despite this drawback, brief evaluations can have value (though shrapnel may fly occasionally), and will be included where feasible in future reviews.

FILMS OF INTEREST

THE BIG Z. 16 mm. Sound. Color. 34 minutes. 1958. *Reviewed by Oswald C. Farquhar.* Detailed geological knowledge of the Blind River area in the Algoma district of Ontario came with the work of W. H. Collins, whose 1925 map showed the Z-shaped outcrop of Huronian rocks, from which the film takes its title. F. Joubin's 1953 discovery of uranium in the lower Huronian Mississagi conglomeratic quartzite was quickly followed by exploration of several orebodies in the Quirke and Elliot Lake areas. The film shows the many stages involved in development of the dozen or so mines, and considers the relative merits of track and trackless methods of extraction. The milling process is followed through to the production of a pelletized concentrate. This is a first-rate account of one of the greatest engineering projects in the world. DISTRIBUTOR: *National Film Board of Canada, 680 Fifth Ave., New York 19, N. Y.*

ISLAND ADVENTURE. 16 mm. Sound. Color. 28 minutes. 1956. *Reviewed by Wakefield Dort, Jr.* The Pacific Coast's first offshore drilling island was constructed in 1954 off Seal Beach, California. Here is shown the entire procedure, beginning with bottom exploration by submarine geologists, followed by building of the steel-reinforced rock island, erection of the drilling rig, and laying of the world's first multiple marine pipeline. This documentary film is suitable for petroleum engineering students, as well as those in general college classes and high school science courses. Some meaningless shots and too-rapid panoramic views mar otherwise good photography. DISTRIBUTOR: *The Texas Co., 135 East 42nd St., New York 17, N. Y.*

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LUNAR SEISMOGRAPH PROGRAM STARTED

The National Aeronautics and Space Administration has awarded contracts of nearly $1 million to the Seismological Laboratory at CalTech and Columbia's Lamont Geological Observatory for design, construction and testing of vertical or 3-component lunar seismographs for studying internal constitution and present tectonic activity of the moon. The project is a joint effort of the two institutions. The system will require special design to meet space, weight and maximum acceleration conditions anticipated on the moon flight. Dr. Frank Press of CalTech. and Dr. Maurice Ewing of Columbia will direct the research program.

GEOLOGY in the Public Eye

by Robert L. Bates

Dept of Geology, Ohio State Univ., 155 S. Oval Drive, Columbus 10, Ohio

A feature of the 1959 class reunions at Cornell University in June was a series of six lectures by members of the faculty. The leader in attendance was Professor Harry Caplan on *"The Classical Tradition."* A close second, with more than 300 alumni present, was John W. Wells on *"The Geological Story of the Finger Lakes Region."* A nicer combination of the humanities and science would be hard to find. The other lectures were on archeology, economics, engineering, and music. . . . The country has a President, the President has a Science Advisory Committee, and the committee has a membership that leaves the earth sciences out in the cold—as usual. There are 8 physicists, 3 physicial chemists, 2 biophysicists, 2 engineers, a metallurgist, and a zoologist, plus an eminent chairman, Dr. J. R. Killian, Jr. Apparently the President needs no advice on geology, geophysics, or oceanography. . . . As you have probably noticed, the late Charles Darwin has achieved the ultimate in posthumous glory: he has been given the nod by *Life* magazine. Darwin's grasp of geological principles, including the concept that the present is the key to you know what, was recorded in the story on atolls and reefs. . . . The New Mexico Bureau of Mines and Mineral Resources is now distributing its *"Scenic Trips to the Geologic Past"* booklets through the Southwestern Monuments Association. Two new booklets are in process, one on the Santa Rita copper deposit and the other on the Clayton-Raton area (Capulin crater, Folsom site). The Bureau is also preparing a geological exhibit for the City of Rocks state park northwest of Deming. . . . The Buffalo Museum of Science has several new pamphlets out. Among them are *Common Fossils of Western New York,* and *How the Great Glaciers Changed the Niagara Frontier,* both by C. A. Heubusch, and *Minerals of the Niagara Frontier Region,* by C. J. Awald. . . . Geology, from the Upper Cretaceous down to the Precambrian, is in the eye of the public who travels Utah Highway 44 into the Uinta Mountains from the north. The Intermountain geologists and the Forest Service have erected signs identifying every formation—18 of them. . . . Sorry to have missed you the last time around. Somebody goofed, and a beautiful string of 40-odd consecutive columns was broken. (What — you didn't *notice?*)

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Chemical Abstracts Announces Price Increase

Chemical Abstracts Service of the American Chemical Society has announced a rate increase beginning in 1960 for individual subscribers from $15 to $27. The base rate to industry will rise from $300 to $570 and the rate for colleges and universities will rise from $80 to $150. There is an additional charge for the indexes accompanying Chemical Abstracts.

St. Louis University Receives Analog Computer

St. Louis University recently received a special analog computer for handling geological and geophysical problems as a gift from The California Company. The Instrument is designed for gravity computations and will be used in the beginning for gravity studies in the mid-western area.

FLORIDA STATE HELD SUMMER INSTITUTE IN MARINE GEOLOGY FOR COLLEGE TEACHERS

Under the directorship of Dr. Donn S. Gorsline, thirty-nine University and College geology teachers attended a National Science Foundation sponsored Institute of Marine Geology and Oceanography at Florida State University 15 June to 8 August. The participants represented 22 states and two Canadian provinces.

Visiting lecturers, specialists in their fields, emphasized recent advances in the areas of geological, physical and biological oceanography, Coastal Plain stratigraphy and geomorphology. The program concluded with a field study of Coastal Plain formations and reef structures of the Florida Keys and Bimini Cay, Bahama Islands.

TOP PHOTO: Group photograph of institute participants: **First Row:** Paul Miller, Marcel Tiphane, John Campbell, Bud Holland, Nancy Gutsch (Institute secretary), Bob Cossaboom, Clarence Miller, Lloyd Schmaltz, Riley Smith, Donn Gorsline (Institute director). **Second Row:** Gordon Winder, Maynard Nichols, Barry Haskell, Leo Thomas, Bill Paine, Herbert Tischler, Bob Schipf. **Third Row:** Ed Eveland, Albert Ruotsala, Barney Pipkin, John Schlee, Ralph Yalkovsky, Herbert Howe, Archie MacAlpin. **Last Row:** Bill Higgs, Jim Schroyer, Harold Brooks, Steve Nordeng, Meredith Jones, Stewart Lowther, Robert Johnson, H. T. Odum, Nolan Shaw, Jack Coash, John McDowell, Joseph Schreiber, Allen Bates, O. T. Hayward, Brewster Baldwin.

LOWER PHOTO: Earl Harrison (left), John Johnsen, E. C. LaFond, Seymour Mack.

SOUTH AFRICAN GEOLOGY QUARTERLY

Many GeoTimes readers with a general interest in South African geology will be most interested in the Quarterly News Bulletin of the Geological Society of South Africa issued 4 times a year in Johannesburg.

The non-member subscription rate is 18/- per year postage paid (or $2.50 U. S.). Subscriptions should be addressed to the *Assistant Secretaries, Geological Society of South Africa, P. O. Box 1071, Johannesburg, South Africa.*

SCANDINAVIA

SCANDINAVIA! Even if you've never been there, chances are that it's a name that already carries deep meaning, because it makes one think of so many wonderful and exciting things . . .

of Viking adventurers who roved the seas a thousand years ago and modern explorers who conquered the North and South Poles . . .

of northern lands sunlit at night and blessed with spectacular scenery: fjords, mountains, sparkling lakes and fairy-tale towns . . .

of modern cities . . . shiny bright . . . famed for their advances in industry, housing, health, welfare, education and cooperatives, and of neat farms that have produced agricultural miracles . . .

of modern designs in glass, silver, ceramics, furniture, lamps and architecture, and handknit sweaters in unique, centuries-old patterns . . .

of polkas and hambos and the music of Grieg and Sibelius . . .

of drama by Strindberg and Ibsen and the fairy-tales of Hans Christian Andersen . . .

of warm hospitality and fabulous food—the smorgasbord and smorrebrod, and pastries and sea food and dairy products . . .

of vigorous, handsome people . . . ski and track champions . . . gymnasts and sailors.

If only a few of these things come to mind as you hear the name Scandinavia, it should be enough.

Perhaps it is because so much of this exciting picture seems to be common to all of Scandinavia that one is tempted to think of the Scandinavian countries as one geographic entity with a single government. But they are, of course, *four separate and independent nations,* as different from each other scenically and culturally as night and day.

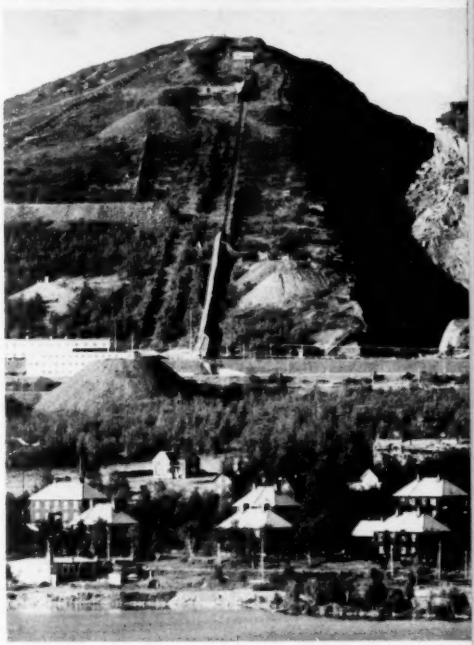
True, there are similarities. Language is one. Danish, Norwegian and Swedish are close enough to each other to be easily understood across one another's borderlines, and although Finnish belongs to the more distant Finno-Ugrian group and is akin to Hungarian, history has made Swedish one of Finland's official languages, too. Thus, tri-lingual conversations are not unusual, and no one calls for an interpreter. But far more important from a tourist standpoint is the fact that English is widely spoken in all four countries—so that there's no need to "bone up" on Scandinavian phrases in order to get around. On the contrary, Scandinavians are only too eager to practice their English on you.

Above left: Molde, on the Romsdalsfjord on the itinerary of excursions A5 and C3 which will be devoted to geomorphology and general geology.

Above right: The Naerofjord, an arm of the Sognefjord also seen on excursions A6 and C3.

Historically, the four countries have common roots also. These date back to the Viking age, from 800 to 1050, when Viking Danes and Norwegians conquered England, controlled the North Sea and roved the whole coast of Western Europe while Swedish Viking expeditions extended through Russia as far south as the Caspian and the Black Sea. Vikings even reached North America 500 years before Columbus. You'll see mementoes of these adventurous days in Scandinavia's many runestones, in the original Viking ships in Oslo, in the ancient Viking fortress at Traelleborg, Denmark, and—because Scandinavians themselves have been inveterate travelers ever since—in the high regard the people have for tourists.

In their progressive way of life, they show other similarities. Denmark, Norway and Sweden are kingdoms, Finland is a republic, but each is vigorously democratic. Six times in the last 900 years,



Above left: The ruins of the 13th Century St. Catherine's church in Visby, Gotland in the area of excursions A22 and C17 which will study Cambro-Silurian stratigraphy.

Upper right: Olavinlinna Castle in Savonlinna, Finland is situated in the center of the beautiful lake country and was built as a fortress in 1475. This is the area of excursions A39, A41 and C36.

Lower right: Town of Kiruna, Sweden with iron-bearing mountains of Luossavaara and Kirunavaara in the background. This area is on the route of excursions A27 and C22.

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these countries have been tied together politically under one ruler. First it was Denmark and Norway from 1030 to 1035 and again from 1380 to 1814; then Sweden and Finland from 1157 to 1809; then Norway and Sweden, 1319 to 1363, and 1814 to 1905; and in one period, from 1389 to 1523, all four were linked in one union. Today the only bonds that tie these countries are perhaps the most significant ones of all, the bonds of friendly teamwork in legal, social, economic, cultural and scientific fields that the world points to with admiration as "Scandinavian cooperation."

Finally, all four countries share jointly the warm blessings of the Gulf Stream, which brings to mind one more date—12,000 B.C., significant as the year Scandinavia began to emerge from the ice and because the climate has been quite pleasant ever since. These countries are also *lands of sunlit nights*, which means that from early May into August the sun brightens them with almost round-the-clock light. In the capitals and the principal cities, hardly enough darkness falls to interrupt your sight-seeing, so that each day is brimful with travel pleasures. In the Arctic regions, the Midnight Sun shines a full 24 hours a day.

The similarities end here. The rest is a variety so vast and so fascinating that the setting changes dramatically country by country. For example:

Denmark

Denmark is a small country but one of intriguing contrasts. Start with Copenhagen, the gay capital, and you're in a modern, bustling city of a million people and as many bicycles. Its picturesque canals, spired buildings and noble palaces blend superbly with the modern architec-

Upper left: A Swedish herd-girl uses the Lur, an ancient Nordic instrument fashioned from birch-wood, to call her cattle. The picturesque Dalecarlia area where this photo was taken will be seen on excursions A3 and C18 which will study the geology of central Sweden.

Upper right: Hans Christian Andersen, 1805-1875, the beloved Danish fairy tale writer, spent his childhood days in this little house, which is now a museum, in Odense. Odense is on the route of field excursions A44 and C39.

Lower left: A typical herring smokehouse at Bornholm, Denmark. Excursions A45 and C40 will visit the island of Bornholm.

ture of its new edifices and match the spirit of its theatres, cabarets, and amusement parks (famed Tivoli is right in the middle of the city). Step beyond the city's limits, and you're in a world of fantasy (though quite real), the world of Hans Christian Andersen, where storks nest on chimney tops . . . geese waddle up narrow, cobblestone streets between tiny thatch roofed houses . . . and moated castles remind you of romantic legends. Stand in the courtyard of Kronborg Castle at Elsinore, and you'll imagine you hear melancholy Prince Hamlet soliloquizing (on occasion Shakespeare's tragedy is re-enacted in this original setting), but just a skull's throw away is Scandinavia's only casino where the international set gathers for fun, as if to emphasize that, Shakespeare notwithstanding, all Denmark is gay, charming, full of the love of life.

Finland

Sixty thousand lakes, boundless forests, mighty medieval castles and lovely cities noted for their cleanliness and advanced design—these spell Finland. Helsinki, the capital, is a gay, friendly city built on a peninsula and surrounded by hundreds of beautiful islands. Its excellent restaurants, colorful cafes, smart shops, and almost continuous sports events at the Olympic Stadium make you want to linger here. But other attractions soon lure you further afield. Only a few hours eastward, through the lovely archipelago, is idyllic Porvoo, the Poet's Town; westward lies Porkkala, the former Soviet naval base. Next, Fin-

land's lake scenery beckons. Closest by is Aulanko, famed resort near Sibelius' birthplace, and from here popular watercoach cruises take you to Tampere, beautiful industrial city. But is is along the winding waterways of the vast eastern lake district that you'll find Finland's most famous landmarks—Punkaharju ridge and Olavinlinna Castle—and some of the world's most beautiful lake scenery. Venture north, in comfort, into Finnish Lapland where modern tourist inns dot an exotic landscape roamed by nomadic Lapps.

Norway

Fjords, mountains, waterfalls and Midnight Sun—Norway offers a new scenic thrill at every bend of the road, and everywhere, in tiny villages (perhaps with a typical stave church), on lofty farms, in bustling seafaring towns, friendliness greets you. Oslo, the Viking Capital, proudly recalls 900 years of exciting adventures, for here, within sight of the interesting open-air Folk Museum, are the original Viking ships, the Polar expedition ship *Fram* and the Kon Tiki balsa raft. Oslo's new City Hall, the mammoth Vigeland sculpture collection and Holmenkollen, the skier's mecca, are other reminders of Norway's bold and creative spirit. Across the lush valleys, the mountains and glaciers are the busy coastal cities of Bergen, historic Hanseatic town and Edvard Grieg's birthplace, and Stavanger, a blend of ancient and modern. Both are ideal starting points for tours into the spectacular fjords—as the Hardanger, Sogn and Geiranger—and cruises up the breath-taking, island-studded coastline that stretches far beyond the Arctic Circle into the Midnight Sun region, where the North Cape and Lapland beckon.

Sweden

Largest of the Scandinavian countries, Sweden opens your eyes to a new world of modern achievement. From the lovely chateau country of Scania in the south to the mysterious Lapland north of the Arctic Circle, there's an air of vigor and wholesomeness that's inspiring. Stockholm, the 700-year-old capital, is a beautiful city on the water where modern buildings that set the pace in architectural design are mirrored opposite the medieval Old City. Pictureques inns, smart shops and the quaint churches and farmsteads of Skansen Park add to the striking character of this metropolis. Beyond lies the idyllic province of Dalecarlia, whose proud inhabitants still cling to colorful folk traditions. Further north is Lapland, made nightless by an eternal summer sun, and visited in the same comfort by modern electric train.

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EMPLOYMENT—*Continued from page 11*

The serious question faces every young geologist, should I go on for a doctor's degree? Is it worth the cost and effort? Many employers are now demanding a doctor's degree for their geologists. Why? Buried in the total cost of a prospecting program which runs to many thousands of dollars per month covering the operation of a camp, food, travel expenses, operation of various vehicles and drills, accounting, and even a part of the salary of the department head, is a little item, "salary of geologist." For a man with a master's degree it may be in the order of $500 to $600 if he has had a little experience. The Ph.D. may demand $750 to $1,000 depending upon experience. For that extra $250 to $400 per month, which may be hardly 5 per cent of the total cost of the project, the employer gambles that his man will have a few more bright ideas that will pay off, and his past experience has shown that it has proved better to have a Ph.D. in charge if he isn't too much of a "long hair." When the project is over, and a little slack period faces the Chief Geologist, it is the man with the BS or the MS who generally is let out, before the Ph.D.

Dedication Still Important

What this leads up to is a general proposition that the geological profession will continue to grow, but those who succeed in it (and many will succeed very well) must first: enjoy what they are doing; second, have an interest in related fields and some ability to perform in those fields; third, not be afraid to get one's hands dirty nor to work beyond the forty hours, have a doctor's degree in some phase of geology, or a degree in geological engineering, and finally the geologist must be one who gets along with people, from the camp cook to the efficiency engineer and the safety man, to name a couple who are usually hard to get along with. The day of the chap who just chases outcrops, or logs drill core and whose only mark of professional aptitude is a beard and an affected accent, is fast passing.

There are chances from time to time for students who have had a year or two of geological work to get a temporary job with a field party as a general helper. A young man with such training is currently employed under the writer's over-all supervision. He drives a truck, crushes and prepares samples and even goes out on his own to collect them. When the season is over his job is done. Such employment should be looked on for just what it is—a chance to recoup depleted finances and return to school, meanwhile obtaining some field experience. During periods of very active exploration, a man with such training might continue to find employment, but the longer he stays at it, without completing his college work and taking one or more advanced degrees, the more vulnerable he becomes to a "shake-out" in a period of lesser activity. There is just no substitute for basic knowledge obtained at the Universities.

A word of appreciation for, and encouragement to the girls who study geology. Your most useful and in the long run most profitable occupation may be as the wife of a geologist, his constant companion (when possible) and his inspiration. If such an opportunity does not offer itself there are more and more office jobs developing for map preparation, working up reports, language translation, mineral identification, and of course more and more of micro and macro paleontological identification and classification, and bibliographic work. Keep at it girls, without you we couldn't get along.

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Popular Geology in Print

by Mark W. Pangborn, Jr.

New books on Darwin and evolution continue to pour from the presses during this Centennial year. The fundamental sourcebook, THE LIFE AND LETTERS OF CHARLES DARWIN (Basic Books, 2 vols., 1959, $10), edited by his son *Francis Darwin* and long unobtainable, has now been reprinted from the 1888 edition; included are Darwin's autobiography and a definitive selection of letters. Reprinted from the first American edition of 1892 is THE AUTOBIOGRAPHY OF CHARLES DARWIN AND SELECTED LETTERS (Dover Publications, 1958, $1.65); also edited by *Francis Darwin*, it differs from the above chiefly in the omission of much of the purely scientific correspondence.

The latest edition of the charming brief AUTOBIOGRAPHY OF CHARLES DARWIN (Harcourt, Brace, 1959, $4.50), edited by granddaughter *Nora Barlow*, restores some 6000 mildly agnostic words suppressed by the family and missing from all earlier editions; essays on Erasmus Darwin and on the Darwin-Samuel Butler controversy complete the book.

CHARLES DARWIN: EVOLUTION AND NATURAL SELECTION (Beacon Press, 1959, $2.25) is a paperback anthology, edited by *Bert James Loewenberg*. Although it does not replace Marston Bates' "The Darwin Reader," it is nevertheless a quite satisfactory gathering of selections from the "Letters," "Beagle," "Origin of Species," and other works. Readers with good eyes will appreciate the inexpensive new reprint of the classic VOYAGE OF THE BEAGLE (Bantam Books, 1958, $.50).

There always seems to be room for another Darwin biography, and *Gertrude Hillelfarb's* DARWIN AND THE DARWINIAN REVOLUTION (Doubleday, 1959, $5.95) is one of the best. Scholarly, well-documented, eminently readable, this volume not only depicts Darwin's illness-haunted life but explores his debts to contemporaries and assesses the impact of his theories on Victorian religion, thought, and society; a good bibliography is provided.

The 12 to 16 year-old group with science interests will enjoy CHARLES DARWIN, by *Sarah Regel Riedman* (Holt, 1959, $3). As in *Evelyn Cheesman's* recent "Charles Darwin and his Problems," Miss Riedman makes the most of Darwin's rather quiet life by stressing the Beagle's voyage; her literary style is better than Cheesman's.

Chiefly of interest to the specialist and to the history of science fan is FORERUNNERS OF DARWIN, 1745-1859 (Johns Hopkins Press, 1958, $6.50), edited by biologist *Bentley Glass*. A collection of erudite essays by authorities, this volume summarizes the contributions of such worthies as Maupertius, Buffon, Diderot, Kant, Lamarck, and Schopenhauer, and provides a setting against which we can properly judge the great Englishman's work; footnotes, but no bibliography. JUST BEFORE DARWIN, by *Milton Millhauser* (Wesleyan U. Press, 1959, $4.50), examines the influence of "Vestiges of the Natural History of Creation," by the Scottish publisher and amateur geologist, Robert Chambers. "Vestiges," long a controversial best seller after its appearance in 1844, was a synthesis of natural history and organic evolution of sorts, and if it had little effect on the development of Darwin's ideas, it surely helped to create in Britain the intellectual climate which assured "The Origin of Species" quick acceptance. "Vestiges" would remain less hazy in most readers' minds if Millhauser had seen fit to include quotations or a summary; good bibliography.

Both scientist and serious layman will enjoy A CENTURY OF DARWIN (Harvard U. Press, 1958, $5.75), a collection of essays by experts, mostly British, and edited by *S. A. Barnett*. "Species after Darwin," "Darwin and embryology," and "Darwin and coral reefs" are among the 15 chapters which show the status of Darwin's ideas today. Rather more systematic and intended for the intelligent layman is zoologist *John Maynard Smith's* THE THEORY OF EVOLUTION (Penguin Books, 1958, $.85). This inexpensive but meaty book confirms Darwin's theories of natural selection, then reveals the latest developments, particularly in the field of genetics; good brief bibliographies.

One of the first to project Darwin's evolutionary theories onto man's own origins was *Thomas Henry Huxley*, who in 1863 published his most famous work, MAN'S PLACE IN NATURE, now available as a paperback (U. of Michigan Press, 1959, $1.75). Drawing on comparative anatomy and on the then truly meager fossil record, Huxley's volume pulled thousands into the Darwinian camp; what a curious little book it seems today!

GEOLOGY IN SWEDEN

(Continued from page 9)

not surprising, therefore, that the number of active researchers in geology is low in comparison to the area they have to cover. The leading geological society (founded in 1871), "Geologiska Föreningen i Stockholm", has about 400 Swedish members, of whom about one fourth have their entire or chief professional activity within the realm of the geological sciences. The government geological survey, Sveriges geologiska undersökning, was established in 1858 and thus has recently celebrated its centenary. Its aim, as originally formulated and still standing, is to bring together, "observing the requirements of science", data on the geology of the practical importance of the rocks and soils. A real mapping is, of course, the chief working way of the Survey, but special problems also occupy much of the time of its officials. Ever since its start, the Survey has formed the country's chief organ for geological study. Mention must also be made of some more recent government institutions, occupied mainly with the study of the Quaternary deposits from an engineering point of view, as the geotechnical institute (Statens Geotekniska Institut), and the geological section of the road institute (Statens Väginstitut).

Three of the universities, those of Uppsala, Lund and Stockholm, each have two chairs in "geology", one for mineralogy, petrology and "hard rock" geology, and the other for historical geology, including paleontology; also, each has an associate professor for Quaternary geology. The two technological institutes each have one professor of mineralogy and geology, the one in Stockholm being devoted mainly to mining geology and that in Göteborg to engineering geology. There are professors of soil-science at the institutes of agriculture and of forestry. Among the departments of the National Museum of Natural History, Stockholm, there are such for mineralogy, paleozoology, and paleobotany.

Geologists are employed by several industrial enterprises. The Boliden mining company which has the largest staff, has established an especially fine record not only for economic work but also for scientific contributions.

In spite of the attractions of geological work as such, there has long been noted a difficulty of filling geological positions with men of sufficient ability and experience. In competition with other branches of science, geology is handicapped by the fact that it does not form a unit in the high-school curriculum. With a limited supply, promising young men are apt to accept positions before they have received sufficient grounding, and thus to restrict their opportunities for a further career in the profession.

Practical Applications Important

Most of the actual problems that occupy research workers in Swedish geology will be apparent from the above sketch. In the practical application of geological knowledge, however, there are some trends that may deserve a special mention. Interest in the prospecting for sulfide ores, as such of copper, was greatly stimulated by the difficulties encountered during World War I, when Sweden was almost completely cut off from foreign trade (with the very large deposits of iron ore, supply of such has never constituted a problem). The years following the war witnessed the development, in Sweden, of efficient electrical methods of locating sulfide ore bodies, and a prospecting campaign was started that is still in full swing. This activity, in which the Boliden company and the government survey are leading, is characterized above all by a fine coordination of geological and geophysical work, and has resulted in discoveries of great national importance.

Another, even more recent development —chiefly after World War II, is in the field of engineering geology. Underground rooms are being prepared for many kinds, workshops of strategic importance, etc., and geological knowledge has found a new and important application. The intensified development of hydroelectric power has similar consequences, with its underground power stations and long tunnels. Not only "hard rock" geologists find their services appreciated, but also soil specialists. For the great seasonal variations in river flow call for reservoirs made by damming rivers and regulating the level of lakes, with accompanying problems of erosion risks in shores consisting of unconsolidated deposits, changed groundwater conditions, etc. Dramatic cases of landslides in Quaternary clays, with much damage to property and communciations, have also called for extensive study by geologists in collaboration with the geotechnicians.

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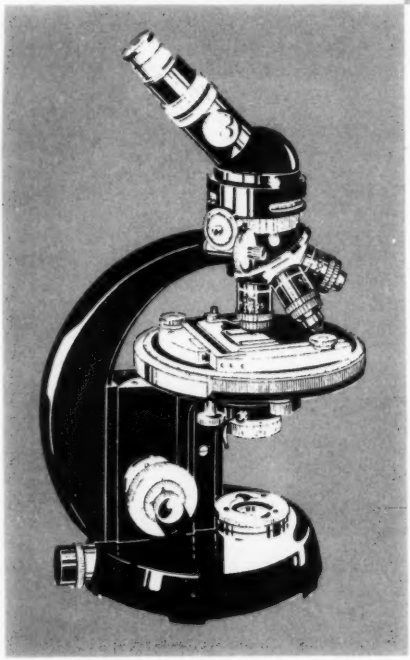

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OIL BELTS—*Continued from page 19*

produced 71 barrels a day. Out of the first 17 wells only one was dry, an experimental well to test the width of the belt. The wells ranged in initial production from 12 to 400 barrels per day.

Angell determined the course of a second belt which ran from the St. Petersburg in Clarion County through Parkers Landing to Bear Creek in Butler County. This belt was known as the "Angell Belt", in later years known as the "Lower Oil Belt". In 1873 he operated successfully in this belt in the Fairview-Greece City area of Butler County. With the outlining of his theory, operations based on oil belts were rapidly developed in Crawford, Venango, Armstrong, Butler, and Allegheny Counties in Pennsylvania, and on the borders of West Virginia and Southeastern Ohio to the northern counties of Kentucky.

For a number of years Angell was associated with F. Prentice and other producers. In 1878 the Pacific Coast Oil Company was organized in California, of which he was for a time manager and director. In 1880 he organized the Angell Oil Company with offices at Knapps Creek, N. Y. In later years he operated a large oil brokerage business with offices in the Tradesman's Building in Pittsburgh.

Of the methods employed in the early oil days in the location of oil wells—clairvoyance, dreams, divining rod, Indian charms, magnetism, and surface indications were all sheer hocus-pocus; the belt theory alone had in it a measure of validity. Any method was apparently successful so long as it chanced to be confined to the area underlain by the productive oil sands. The belt theory, because it has some of the elements of the true theory of the formation of these oil sands as offshore bars, was therefore a step in the right direction. It was unfortunate for those who relied entirely on the belt theory for the oil sands were not laid down in straight and continuous lines as Angell presumed through the whole country, but were subjected to breaks and curves.

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INTRODUCTION TO THE THEORY OF SOUND TRANSMISSION: With Applications to the Ocean

By C. B. OFFICER, Rice Institute. *McGraw-Hill International Series in the Earth Sciences.* 284 pages, $10.00

A senior-graduate text for students of geophysics, geology, and physics (acoustics). This is the first book on the theory of sound transmission to be published since Lord Rayleigh's THEORY OF SOUND published in London, 1894. Rayleigh's is an exhaustive treatise; Officer is intended as an introduction to acquaint the reader with the *theory* of sound transmission so that he may feel at ease with the published material in the field.

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An advanced volume of great value to graduate students in geology, geophysics and related fields. It presents new conclusions of the earth's tendency towards equilibrium, and of the character and size of deviations from this equilibrium. The approach is entirely new, with the material based mainly on the authors' studies. Recent advances covered include the global significance of the pendulum apparatus of Vening Meinesz for gravity observations at sea.

INTRODUCTION TO GEOPHYSICS

By BENJAMIN F. HOWELL, JR., The Pennsylvania State University. *McGraw-Hill International Series in the Earth Sciences.* 399 pages, $9.00.

A beginning college textbook on the physics of the earth. The principal objectives are to familiarize the reader with the scope of geophysics in relation to the other sciences, to give him some insight into the methods used by geophysicists to study the earth, and to outline some of the most important discoveries of these researches. All major developments in the field reported before 1957 are covered.

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DRILLING THROUGH THE EARTH'S CRUST *a report by the AMSOC Committee, NAS-NRC Publication 717, 20 pp., 1959. Publications Office, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington 25, D. C. $1.00.*

ABSTRACT: The AMSOC Committee believes that it is both desirable and feasible to drill a hole completely through the earth's crust beneath the ocean. It is desirable because there seems to be no other way of obtaining unambiguous scientific information about the composition, age, and physical characteristics of the mantle and the deep crustal rocks. It is feasible because there are places where the Moho approaches within 9.5 kilometers of the sea surface. This depth appears to be within the reach of the best of modern drilling equipment. A program is proposed for obtaining the necessary data by drilling preliminary test holes, for designing and building a deep-drilling vessel and for drilling to the Moho.

The appendix lists the following Mohole project committees: *Panel on Scientific Objectives and Measurements,* H. S. Ladd, Chairman; *Panel on Site Selection,* H. H. Hess, Chairman. *Chairman of the AMSOC Committee* is Gordon G. Lill.

THE COMPOSITE INTERPRETIVE METHOD OF LOGGING DRILL CUTTINGS, *by John C. Maher, Guidebook VIII, 1959, available from the Oklahoma Geological Survey, Norman, Oklahoma. $1.50.*

A report which describes a research technique and system for description of oil well drill cuttings. The report will be most valuable to students and practicing petroleum geologists.

BIBLIOGRAPHY OF NORTH AMERICAN GEOLOGY, *1956, U. S. Geological Survey Bull. 1075, 554 pp., 1959, U. S. Government Printing Office, Washington 25, D. C. $1.75.*

All geologists will be most pleased to see that this new volume has appeared, for it constitutes an invaluable bibliographic reference. About 4000 entries.

CONCISE DICTIONARY OF SCIENCE, *by Frank Gaynor, Philosophical Library, 15 East 40th Street, New York, N. Y., 1959, 546 pp., $10.00.*

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Principles of Geology by Gilluly, Waters and Woodford. *534 pp., 335 illus., 2nd Ed., 1959, $7.50.* The new edition is rewritten, and reset to improve an already well-received introductory book.

Mineralogy, Concepts, Descriptions, Determinations by Berry and Mason. *612 pp., 265 illus., 1959, $8.75.* A *new* mineralogy book in the real sense of the word. The significance of minerals in terms of geological processes is given, and the chemistry and genesis of minerals are discussed in detail.

General Crystallography, A Brief Compendium by deJong. *296 pp., 1959, $6.00.* Translated from the Dutch, this is a concise treatment of the subject, dealing with the geometrical, structural, chemical, and physical aspects.

Stratigraphy and Sedimentation by Krumbein and Sloss. *497 pp., 123 line drawings, 1951, $6.50.* Field and laboratory techniques are emphasized in this work which explores the relationship between stratigraphy and sedimentation.

Rocks and Mineral Deposits by Niggli. *559 pp., 331 illus., 73 tables, 1954, $12.00.* An English translation of one of the most significant contributions to mineralogy ever published. GESTEINE UND MINERALLAGERSTAETTEN (Vol. 1, 1948).

Stratigraphic Geology by Gignoux. *682 pp., 155 illus., 1955, $9.50.* An English translation of the 4th Ed. of GEOLOGIE STRATIGRAPHIQUE has made a classic of geologic literature available to a wide range of readers.

Petrography, An Introduction to the Study of Rocks in Thin Sections by Williams, Turner, and Gilbert. *406 pp., 133 illus., 1954, $6.50.* Exceptional illustrations enrich this book of the petrography of igneous, metamorphic, and sedimentary rocks.

Geology of Petroleum by Levorsen. *703 pp., 327 illus., 47 tables, 1954, $9.00.* This comprehensive work for both students and professionals, shows the principles (rather than the techniques) of discovering oil.

Elementary Seismology by Richter. *768 pp., 205 figs., 47 tables, 1958, $12.00.* A statement of the data and principles of field and laboratory seismology for professionals, students and engineers.

The Permian Reef Complex of the Guadalupe Mountains Region, Texas and New Mexico by Newell *et al.* *236 pp., 225 illus., 1953, $7.50.* The first modern, comprehensive description and interpretation of a major Palaezoic reef complex.

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sis in selecting terms for definition has been placed on the fields of physics, mathematics, nucleonics, astronomy, and chemistry.

There are relatively few definitions of geological terms in this dictionary, and the author's selection of terms to be defined is most erratic. For example, he defines both "MOHO" and "Mohorovicic discontinuity", but does not define "igneous" or "igneous rock". In his effort to be concise, the auther misses the essentials in some of his geological definitions. Furthermore, a number of the geological terms that he does define are outmoded or obsolete forms or usages. Where a word has different meanings in different fields of science, the geological meaning is rarely given. Our familiar geological term "nappe" is defined only as "One of the two parts of a conical or pyramidal surface which are separated by the vertex."

One can only conclude that this book is of little value to a student in the geological sciences.

A.G., Jr.

REGIME BEHAVIOUR OF CANALS AND RIVERS *by T. Blench, 138 pp., 1957, Butterworths Scientific Publications, 88 Kingsway, London, W.C. 2, England. $6.00.*

This book provides much information of use to geologists engaged in study of sedimentation and will be helpful to engineering geologists working on problems relating to canals and rivers.

PERSPECTIVES ON CONSERVATION: ESSAYS ON AMERICA'S NATURAL RESOURCES, *edited by Henry Jarrett, 260 pp., 1958, The Johns Hopkins Press, Baltimore 18, Md. $5.00.*

An assemblage of papers on conservation which were presented at a forum series sponsored by Resources for the Future in early 1958 and directed toward 50 years of conservation following the 1908 Governors Conference called by President Theodore Roosevelt to consider resource problems.

ELEMENTARY SEISMOLOGY, *by C. F. Richter, 1958, 768 pages, W. H. Freeman and Company, San Francisco, California.*

The coverage of earthquake seismology in this well written book is encyclopedic. Results of explosion seismology as related to crustal structure have been summarized but exploration seismology has been omitted. Effects, geology, geography, and field investigations of earthquakes are ex-

tensively treated along with standard material on instrumentation and seismic waves. Emphasis on the field investigation of the effects of earthquakes will be of interest and value to geologists. Although the mathematical treatment is largely elementary the book's scope, extensive bibliography and many appendices make it valuable to the professional seismologist and to researchers in related fields.

PRINCIPLES OF PHYSICAL SCIENCE, *by F. T. Bonner and M. Phillips, 736 pp., 1957. Addison-Wesley Publishing Co., Inc., Reading, Mass. $7.50.*

The text designed for the teaching of physical science survey courses for college students devotes about 100 pages to geology.

HANDBOOK OF NATURAL GAS ENGINEERING *by D. L. Katz, D. Cornell, R. Kobayashi, F. H. Poettmann, J. A. Vary, J. R. Elenbaas and C. F. Weinaug, 802 pp., 1959, McGraw-Hill Book Company, 330 West 42nd Street, New York 36, New York. $37.50 (AIME members $30.00).*

Don't let the price scare you. For an engineer in the oil and gas industry it will be worth many times its price.

This comprehensive reference contains under one cover practically all basic concepts and information needed by engineers associated with the gas industry. Basically it is a well organized summary of the important published technical work of the industry. Covered by 19 chapters are such topics as properties of reservoir rocks, phase behavior, gas-flow measurements, development and operation of gas fields, fractional distillation, dehydration and sweetening, underground storage, and conservation and government regulation.

The 1079 illustrations, charts, and tables are helpful for quick comprehension of the material presented. But really more than the handbook the title implies, it contains background discussion necessary for full understanding and is suitable as a college text. Of particular value is the long list of references which makes it possible to find pertinent literature without the time consuming searches which are so often required.

Every engineer in the oil and gas industry should have easy access to this volume. It is particularly recommended for the young engineer since it presents a broad picture of the various phases of gas engineering.

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WATER AND ITS CONDITION IN SOILS, *an International Symposium, edited by Hans F. Winterkorn, Highway Research Board Special Report 40, 338 pp., 1958. Order from Publications Dept., National Academy of Sciences 2101 Constitution Ave., Washington 25, D. C. $6.00.*

An assemblage of important scientific papers on water-soil relations edited under the HRB Committee on Physico-Chemical Phenomena in Soils from papers presented at the International Symposium on Water and Its Conduction in Soil, Washington, D. C., January 1958.

This report is a must for the engineering and ground water geologists. It will also prove of great value to the geology teacher attempting to widen the scope of understanding of students in the areas of weathering and soils.

SCIENTIFIC RUSSIAN, *by George E. Condoyannis, 225 pp., 1959, John Wiley & Sons, Inc., New York.*

A major concern of geologists is the volume of Russian geologic literature available and the scarcity of geologists able to translate it. This book helps solve the scientists' problems in that it does not presume that a speaking knowledge of Russian is wanted, and so concentrates on the fundamentals needed to read scientific Russian. The alphabet, nouns, verbs, and the grammatical constructions most frequently encountered in scientific material are presented, step-by-step, from the not-so-difficult to the more difficult.

T.F.R.

More About Our Cover

View of the Mineralogical Museum of the University of Copenhagen, Headquarters of the XXI International Geological Congress 1960.

The pointed rock in the yard, a little to the left of the center, is the Iron Meteorite "Savik" from Thule, NW Greenland, brought to Denmark by the Danish Arctic Explorer Knud Rasmussen.

CIVIL SERVICE EXAM

Announcement for a new examination for geologists Grades GS-5 and GS-7 - Salaries: GS-5 $4,490, GS-7 $5,430. The examination is to be used for filling in positions in the Department of Interior. The closing date for receipt of applications is December 1, 1959. The examination will be given January 11, 1960. Apply to Executive Secretary, Board of U. S. Civil Service Examiners, Geological Survey, Department of Interior, Washington 25, D. C.

AGI Nominating Committee Reports

The AGI Nominating Committee, appointed by Paul Lyons, President, has proposed the following slate of officers for the Institute for the year beginning at the close of the November 1959 annual meeting of the Board of Directors:

For President

RAYMOND C. MOORE

Professor Emeritus, University of Kansas

For Vice President

IAN CAMPBELL

Chief, California Division of Mines

For Secretary-Treasurer

DONALD H. DOW

U. S. Geological Survey

In accordance with the AGI Constitution and By-Laws, additional nominations may be made by the Directors at the Board Meeting, prior to the balloting.

The Nominating Committee members were James R. Balsley, Noel H. Stearn, and Joseph L. Gillson, Chairman.

Congress Travel Grants

The National Science Foundation has announced that it will have a limited amount of money available for grants to aid the travel of American scientists to the international congresses scheduled to be held in the Scandinavian countries in the summer of 1960. If you have been reading your *GeoTimes* regularly, you know that these are: International Union of Geodesy and Geophysics, Helsinki, July 25-Aug. 6; International Geographic Congress (IGU), Stockholm, Aug. 6-12; and the International Geological Congress, Copenhagen, Aug. 15-25. The exact number of awards has not been determined, but probably will not exceed more than 10 grants for each congress. The grants will be limited to round-trip air-tourist fare from the applicant's home to the place of the congress.

Application blanks may be obtained by writing to *Earth Sciences Program, National Science Foundation, Washington 25, D. C.* Closing date for applications will be December 15, 1959, and the awards will be announced sometime in February, 1960.

DEAR EDITOR:

From the comments of R. Bates on drilling to the Mohorovicic Discontinuity in the last issue of Geotimes, one easily concludes that the thinking of geologists is shallower than that of the geophysicists who back the project.

A. E. MAXWELL
Member Committee
American Miscellaneous Society

DEAR EDITOR:

One of your contributors, Robert L. Bates has apparently started a personal war through one of your regular columns against the "Mohole project". One derogatory comment was made in the May-June issue and in the July-August number he states that "The whole project started as a joke and it should be allowed to die as one". No reasoned scientific basis is given for such a remark. Without for a moment acknowledging that the projected started as a joke one may recall the old adage that "many a truth has been spoken in jest".

I believe that the Mohole project is one of the most imaginative potentially significant research proposals for the fields of geology and geophysics ever to be seriously backed. Interested scientists may find a very good statement of the project in the April number of the Scientific American for 1959 (p. 41-49).

Bates intimates that the major reason for drilling the hole is because if we don't the Russians will. I too believe this is not a good basis for consideration of such a project. Indeed ideally it would be preferable if the job could be carried out through the cooperation of the U.S., the U.S.S.R. and other nations under the auspices of the International Union of Geodesy and Geophysics. But this does not seem practical at this time though perhaps after the first hole has been drilled later projects may and should be developed cooperatively.

One might comment that implicit in some criticism of the Mohole project is the idea that geologists should be content to continue to take a bat's view of the deeper parts of the earth; that is remain dependent largely on wave impulses, and effectively blind as to actual visual observation of the materials in daylight.

The International Union of Geodesy and Geophysics at its assembly in 1957 passed a resolution urging such a drill hole. The project has obviously appealed to some men of broad future-looking vision if a report in a recent New York Times item is correct to the effect that General Motors is prepared to contribute the equivalent of a million dollars toward its success.

GeoTimes should clearly state that comments of its regular contributors do not necessarily reflect any official position of the American Geological Institute on such problems in order that there may be no misunderstanding.

I do not have and have not had any direct connection with any committee associated with this project but I should like to urge that all geologists and geophysicists study the potentialities and if they are favorable lend their enthusiastic support.

A. F. BUDDINGTON
Princeton, N.J.

EDITORS NOTE: From our masthead we quote: "The American Geological Institute and its member societies assume no responsibility for statements and opinions advanced by contributors to GeoTimes." However, one can but wonder if the drilling of the Mohole is more important than a dollar-equivalent investment in geologic mapping, geochemical research and other less glamorous types of geological research which remain undone. It also might be noted in passing that several requests for a GeoTimes story on the Mohole Project directed to AMSOC Committee members have gone unacknowledged.

DEAR EDITOR:

Has there ever been an attempt to license geologists in the State of New York, and if so, what has been the big stumbling block? Also, what measures can be taken to help bring about the licensing of the Professional Gelogist in this, or any, state?

The day has come when the geologist is no longer restricted to the petroleum and mining industries, and is entitled to rights equal to those of the Professional Engineer. In this state, the P. E. can describe to his clients the geology of a building site, the origin and probable extent of a sedimentary deposit, etc. If the Consulting Geologist investigates something that lies in the overlapping portion of both fields, he is immediately investigated by the P. E. Ethical Committee. The overlapping of the two fields must be reckoned with, and this may be accomplished by means of charter and license.

Very truly yours,

PATRICK DOMENICO

DEAR SIR:

I should like to suggest a change in one of the mapping symbols that has become standard, at least by the U.S.G.S., but which I believe should be changed in the interests of accuracy. Heretofore all mine dumps have been shown with a dashed or non-lined rim, and a solid-line toe, as follows:

In actual mapping practice the rim of a dump is usually well-defined, whereas the toe of the dump (especially where slopes are steep) is generally poorly defined. If we are to use lines in the manner that is recommended for outlining other contacts, i.e., solid lines for specifically controlled points and dashed lines for approximately located points, I suggest we do the same with our dump terminology. Hence, the rim of dumps should be shown as solid lines, and the toes as dashed lines, as follows:

We have adopted this practice at Philippine Iron Mines.

I should be interested in comments of your readers.

Yours very truly,

JOHN E. FROST,
Chief Geologist
Philippine Iron Mines, Inc.
Larap, Jose Panganiban
Camarines Norte, Philippines

Duluth Conference

(Continued from page 22)

of Visitors recharged the Duluth Conference with interest and enthusiasm, so that the last two weeks of the session was marked by intensive concentration.

Much work remains to be done before the sourcebook and the reference book are acceptably edited and adequately tested so that they may be introduced to aid in improving the teaching of geologic subject matter in school science programs across the country. Furthermore, the job will never truly be finished; the materials must be constantly reviewed and improved. The Duluth Conference, however, is the start of a long needed program to improve the understanding of geology in our schools and by the general public.

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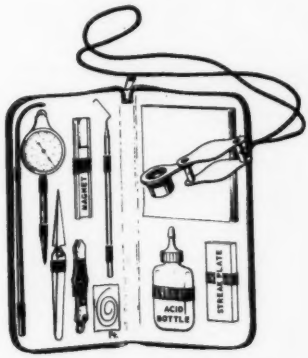

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WANTED: Volunteer Abstracters

Engineering geologists take note . . .

Those of you who have seen the first several issues of GeoScience Abstracts, now published regularly by the American Geological Institute, have noted that Section 14, on Engineering Geology, is notably thin. Here is a chance for you to help your colleagues, and yourselves, by strengthening the coverage in our specialty.

In asking for help, AGI Executive Director Stephenson wrote GSA Engineering Geology Division Chairman, Robert Legget, as follows:

"It is my own observation that articles relating to engineering geology very frequently do not appear in the major bulletins of the profession, the Bulletin of the GSA for example.

"It is my further observation that the articles relating to engineering geology are scattered 'from hell to breakfast' and rarely are these in journals that would regularly come to our attention and rarely will they be already abstracted.

"I am wondering whether it will be possible for the engineering geologists of North America to pitch in and help AGI to provide adequate coverage of the geological literature in this field, either through the engineering geology section of the Geological Society of America or some other mechanism."

In response to the AGI invitation, Chairman Legget has asked Edwin B. Eckel to form a committee on abstracts.

It should be feasible to make up a list of all engineering and geology journals and official publications that are likely to contain articles of interest to engineering geologists. It should also be possible to get together a group of volunteers—or draftees—who would be willing to take responsibility for abstracting all pertinent articles that appear in a small group of these journals. Choices of journals should depend on interests of the abstracters and availability to them of particular journals. The teachers among us, incidentally, could do worse than to give their students an opportunity to learn to read and abstract the literature.

For the time being, at least, coverage is limited to North America. The only remuneration to abstracters is increased personal knowledge and a feeling of service to their fellow-scientists.

Volunteers and ideas are both needed. If you are willing to work on the committee and to scan a few journals regularly, or if you have constructive ideas as to makeup or work, please communicate directly with: Edwin B. Eckel, *Chief, Engineering Geology Branch, U. S. Geological Survey, Bldg. 25, Federal Center, Denver 25, Colorado.*

All Geologists take note of still other . . . abstracting problems

Author's abstracts have become standard for most literature appearing in our geological journals today. Unfortunately, however, author abstracts are not required by contributors of shorter contributions appearing in some of our better journals. For example: Short Notes in the GSA Bulletin, Scientific Communications & Discussions in Economic Geology, Geological Notes in the AAPG Bulletin, and Notes and News in the American Mineralogist. Similarly, photogeology notes appear from time to time in Photogrammetric Engineering. Abstracts of the geology-geophysics articles appearing in these would greatly add to the effectiveness of the coverage of GeoScience Abstracts.

If you are in a position to aid in improving the coverage of GeoScience Abstracts by volunteering to prepare abstracts of one or more of these journals you are urged to write to Martin Russell, *Managing Editor, GeoScience Abstracts, American Geological Institute 2101 Constitution Avenue, N.W., Washington 25, D. C.*

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VACANCIES

EDITORIAL ASSISTANT. Bachelor's degree in earth sciences. To assist editor in preparing technical manuscripts and geologic maps for printer. Typing helpful. Write fully to Vernon E. Scheid, Director, Nevada Bureau of Mines, Reno, Nevada.

WANTED: GEOLOGIST-ENGINEER. With thorough knowledge of concrete, soil mechanics, minor experience in civil engineering, geophysics and ground-water hydrology. Age under 45. Southwestern location. Applicant must be a registered civil engineer in the state of California. Box 111.

GEOPHYSICIST with Ph.D. or equivalent experience for a challenging position at RCA Laboratories. Fundamental studies of elastic wave propagation related to communications systems. Send reaume to Mr. J. D. Bowker, Dept. RL-5K, RCA Laboratories, Princeton, New Jersey.

PROJECT DEVELOPMENT EXECUTIVE—MINING INDUSTRY. A senior man with geological or mining engineering background who is familiar with geophysical application is required by an international service organization. A knowledge in depth of North American mining is required and international experience is an asset. The degree of client contact necessitates that the successful applicant be able to carry through negotiations with senior, professional and business executives. BOX 112.

POSITION FOR EXPERIENCED TEACHER, qualified for full or associate professorship, eventually to head department in eastern men's college. Give courses in elementary physical, historical and engineering geology and upper class work in regional geomorphology and geology of the U.S., glacial geology, mineralogy and petrology. BOX 113.

POSITIONS WANTED

BOX 481. RESEARCH PETROLEUM GEOLOGIST-STRATIGRAPHER, 30, M.S. Extensive experience in most provinces U. S. and Canada. Have utilized newer exploration tools; Entropy Lithofacies mapping, Gamma-Halo surveys, porosity maps, moment maps, etc. Desire position of responsibility in research or exploration. Executive ability.

BOX 610. PALYNOLOGIST, MS, 34, married, five years experience in Spore and Pollen field. Desires to relocate with company with such a program or interested in such. Would consider university undergraduate teaching with possibility of research and advanced degree in Palynology.

BOX 611. ASSISTANT PROFESSOR, Ph.D. major university wishes to teach in college or university in more desirable area. 3 yrs. teaching and 6 yrs. varied industrial experience. Primarily interested marine geology, paleontology, sedimentation, mineralogy. Active researcher, member prof. societies. Resume on request.

BOX 612. MUSICIAN and composer; full professor; major university; Yale graduate; 13 yrs. teaching experience; former violinist in internationally famous string quartet; Guggenheim Fellow; married; 2 children; wishes to teach in college or university in more desirable area; amateur geologist; would appreciate your bringing this ad to the attention of your Music Department. Resume on request.

BOX 614. RETIRED PROFESSOR of Geology desires a one year connection with a school in the south or southwest. Married, 68 years of age, active, excellent health. Is prepared to teach physical geology, optical mineralogy, petrography of igneous, metamorphic, sedimentary rocks, and engineering geology. Would teach historical geology or mineralogy.

BOX 620. GEOLOGIST, B.S., May I help you? Experienced as seismic crew observer and computer, foundation test boring and mineral investigations. Sales engineer and organizer. Presently employed as geologist. Desire progressive company.

GEOCHEMIST, 43, Ph.D. (London), Head of Dept., is due for sabbatical leave any time from Jan. 1960 onwards, requires post of visiting professor or fundamental research in petroleum or mining industry in N. America or England. Several major publications and further works projected, aiming of opening up new orientations, such as, metamorphism of carbonaceous phase, certain geochemical aspects of hydrothermal, fumarolic and evaporite deposits, conversion mechanism of allotropic modifications; co-author of "Organic Geochemistry" to be published by Pergamon Press. Experienced lecturer, particularly in geochemistry and economic geology. Contact Prof. Dr. G. Mueller, Depto. de Geologia, Cas. 53-C, Universidad, Concepcion, Chile.

BOX 627. GEOLOGIST, B.S., Geology, 3½ years diversified experience with major oil company in Venezuela. Single, in mid-twenties, desires position with aggressive oil company domestic or foreign, willing to travel. Experience includes subsurface, special geological studies, administrative assistant. Currently employed, available 1-2 months.

BOX 630. GEOPHYSICIST, B.S. in geology, 11 years seismic experience including 4 years party chief and 3 years review work. Presently employed. Wants responsible job requiring both administrative and technical ability. Will go anywhere. Rocky Mountain area preferred.

BOX 631. GEOLOGIST, M.S., 7 yrs. experience, West Texas, Venezuela and Libya, interested in electric log analysis and interpretation, facies studies. Will travel. Desires position in oil industry and/or teaching.

BOX 635. GEOLOGIST, M.S., 28, married. Desires position in mining, exploration or photogeology. Will consider both domestic and foreign work.

BOX 636. GEOLOGIST, Ph.D., 39, family. Desires permanent teaching position. Available in January. Qualified to teach structural geology, sedimentology, stratigraphy, paleontology, geomorphology and photogeology. Experience: 4 years university teaching, 6 years with major oil company.

BOX 637. GEOLOGICAL ENGINEER, M.S., 25, single, 3 yrs, experience as instrument operator and computor with seismic crew, now desires to become established in mineral exploration field. Thesis experience in photogeology. Foreign positions acceptable.

BOX 638. PETROLEUM GEOLOGIST-SEDIMENTOLOGIST, Ph.D., 39, married. Six years experience as petroleum geologist, field and subsurface, in Latin America. Teaching experience. Desires position in research or exploration problems with broad scope, domestic or foreign.

POSITIONS WANTED—*Continued*

BOX 639. GEOLOGIST-GEOPHYSICIST, 35, B.S., Geology. 4½ years experience in Gulf Coast, Rocky Mt., East and West Texas with major oil company. All phases of exploration, seismic reflection interpretation, administration, and supervision. Desires position. Presently employed.

BOX 640. PETROLOGIST, 38, Ph.D. '52.

BOX 641. PETROGRAPHER-MINERALOGIST, M.S. from eastern university. Experienced in thin section and mineral fragment identification. Desires employment in petrographic work.

BOX 642. PETROLEUM GEOLOGIST, Ph.D., 20 years experience including concession negotiation and management of exploration overseas. Prefer Latin American assignment owing to familiarity with Spanish.

BOX 643. GEOPHYSICIST-GEOLOGIST, M.S. Broad science and math background. Over eight years seismic, gravity, and subsurface experience with major oil company in several oil provinces. Disenchanted with long-range exploration future of oil industry. Desires association with organization offering broad range of applied geophysical services for earth and space. Interested in operations, interpretation, and administration.

BOX 644. MINERALOGIST-GEOLOGIST, M.S., married, 28, veteran. Good background in chemistry and electronics. Consider any offer. Available in November. Resume on request.

BOX 645. GEOLOGIST, 25, B.S. and 2 years experience in surface and subsurface geological mapping, ore reserves, core logging and exploration. Relocate anywhere.

BOX 646. GEOLOGIST, broad exploratory background in the Four Corners, Panhandle and West Texas. Eight years experience includes subsurface, administration and seismograph. Some field and well work. Desires more responsibility.

BOX 647. GEOLOGIST, Ph.D., 34, married. Desires permanent teaching position in small to moderate size school and town, preferably in south or west. Broad geological background in teaching and research, especially in sedimentary rocks, principles of stratigraphy, petroleum geology, and mineralogy. 2½ years experience with major oil company.

BOX 648. GEOLOGICAL and invertebrate fossil preparator, married, 33, desires curatorial position in museum or industry. 7 years of experience with oil company, major credits short of B.S. in Geology, knowledge of stratigraphy, micro-photography and experienced collecting, preparing, studying and exhibiting material.

BOX 649. GEOLOGIST, B.S., age 24, single. Desires position in either petroleum or mining. 1½ years experience in exploration, mining, and milling of manganese ores in West Va. and Va. Available immediately.

BOX 650. GEOLOGIST, petrologist, micro-paleontologist, B.A., M.S., 37, single. Training and experience in petrology and micro-paleontology, 12 years of experience in museum work. Graduate work in palynology, stratigraphy, petroleum geology and protozoology. Some teaching experience. Most work towards a Ph.D. completed. Desire position in major company or permanent teaching position in university, preferably in south or west. Will consider foreign work. Mastery of German and Spanish. Resume on request.

BOX 651. GEOLOGIST, M.S., 26, family, desires permanent position. 3 season iron ore, base metals exploration in U.S., Canada. Military service in photogrammetry. Teaching experience in engineering geol., field geol., geophysics, mineralogy. Currently employed; available Nov. 15. Resume and references on request.

BOX 652. PETROLOGIST-MINERALOGIST, Ph.D., 31. Desires teaching-research position preferably in U.S. Principal fields: petrology, mineralogy, structural geology, geochemistry. Experience: 3 yrs. U.S.G.S., 3½ yrs. foreign geol. survey, ½ yr. teaching at U.S. univ. U.S. citizen. Resume and reprints on request. Available Sept. 1960.

BOX 653. GEOLOGIST, Ph.D. 7 yrs. field experience in U.S. and Norway, some teaching experience in U.S. Numerous publications, U.S. and foreign journals. University position with graduate and advanced undergraduate teaching in petrology, mineralogy, crystal chemistry, and geochemistry desired. Opportunity for research essential. Now abroad. Available after Int. Geol. Congress, 1960.

BOX 654. PALEONTOLOGIST, Ph.D., 28, four years university teaching experience in physical, historical, paleontology, geomorphology and glacial geology, Assistant Professor. Eight field seasons with major oil company and Geological Survey mapping surface structure in Rocky Mountains. Primary research interests are Paleozoic invertebrates and history of geology. Desires teaching or research position. Resume on request.

BOX 655. GEOLOGIST, Ph.D., 35, on sabbatical leave beginning February or June, 1960. Available for project work of any type, preferably foreign. Broad scientific background and diversified practical experience, especially within the mineral industry. Works well with people and enjoys all phases of the profession.

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BOX 656. MINING GEOLOGIST-PETROGRAPHER, M.S. (Geol.), 27, family, 2 years research petrographer for major company; field investigation and mapping experience. Desires position with mining concern in western U.S.A., Canada, or Alaska offering exploration work. Employed; available during 1960 upon reasonable notice.

BOX 657. HARDROCK GEOLOGIST, Ph.D., 10 years varied experience with large mining corporation seeks position with diversified interests and permanent base of operations. At present resident in South Africa. Veteran. Late thirties. Family. Employed.

BOX 658. RETIRING DEPARTMENT CHAIRMAN with 30 years of successful teaching in eastern men's college is interested in 1 semester or 1 year appointments beginning September 1960 as visiting professor or lecturer. Especially interested in courses in regional geomorphology and geology of U.S. and history of geological science.

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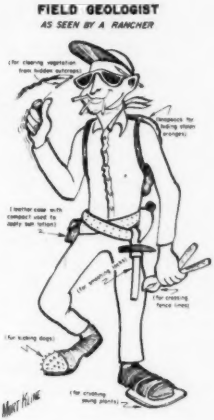

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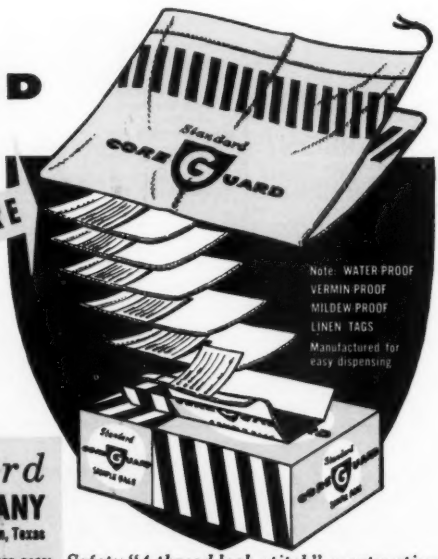

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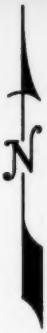

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